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Agilent Technologies

Model 979 Helium Mass Spectrometer Leak Detector

FIELD SERVICE COMPONENT REPLACEMENT MANUAL

DRAFT 1/27/03

Manual No. 699909976
Revision B
January 2003

Model 979 Helium Mass Spectrometer Leak Detector

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Frederick C. Campbell

CE

Frederick C. Campbell
Operations Manager
Varian Vacuum Technologies
Lexington, Massachusetts, USA

June 2002

Warranty

Products manufactured by Seller are warranted against defects in materials and workmanship for twelve (12) months from date of shipment thereof to Customer, and Seller's liability under valid warranty claims is limited, at the option of Seller, to repair, to replace, or refund of an equitable portion of the purchase price of the Product. Items expendable in normal use are not covered by this warranty. All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Seller, are due or traceable to defects in original materials or workmanship. All obligations of Seller under this warranty shall cease in the event of abuse, accident, alteration, misuse, or neglect of the equipment. In-warranty repaired or replaced parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts. After expiration of the applicable warranty period, Customer shall be charged at the then current prices for parts, labor, and transportation.

Reasonable care must be used to avoid hazards. Seller expressly disclaims responsibility for loss or damage caused by use of its Products other than in accordance with proper operating procedures.

Except as stated herein, Seller makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated herein, Seller shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise. Statements made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon Seller unless reduced to writing and approved by an officer of Seller.

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Warranty Replacement and Adjustment

All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto, and must be received within the applicable warranty period by Seller or its authorized representative. Such claims should include the Product serial number, the date of shipment, and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from Seller or its authorized representative for the return and instructions as to how and where these Products should be returned must be obtained. Any Product returned to Seller for examination shall be prepaid via the means of transportation indicated as acceptable by Seller. Seller reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been returned by non-acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason, Customer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or non-conformity in the Product. In all cases, Seller has the sole responsibility for determining the cause and nature of failure, and Seller's determination with regard thereto shall be final.

If it is found that Seller's Product has been returned without cause and is still serviceable, Customer will be notified and the Product returned at Customer expense; in addition, a charge for testing and examination may be made on Products so returned.

Items Not Covered Under Warranty

Examples of items not normally covered under warranty include ion sources, TC gauges, O-rings, spectrometer tube cleaning and overhaul, mechanical pump oils, vacuum system overhauls, and obvious abuse or customer error. These items are considered normal maintenance for this type of equipment.

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Hazard and Safety Information

Some common international symbols used in this manual and the equipment itself are shown below.

O	OFF Power Switch Position	⏚	Earth Ground
|	ON Power Switch Position		Hot Surface
~	AC – Alternating Current		Dangerous Voltage, Risk of Electrical Shock

This manual uses the following standard safety protocols:

NOTE *The notes contain important information taken from the text.*

CAUTION *The caution messages are displayed before procedures, which if not followed, could cause damage to the equipment.*

WARNING *The warning messages are for attracting the attention of the operator to a particular procedure or practice which, if not followed correctly, could lead to serious injury.*

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Operators and service personnel must be aware of all hazards associated with this equipment. They must know how to recognize hazardous and potentially hazardous conditions, and know how to avoid them. The consequences of unskilled, improper, or careless operation of the equipment can be serious. This product must only be operated and maintained by trained personnel. Every operator or service person must read and thoroughly understand operation/maintenance manuals and any additional information provided by Varian Vacuum Technologies. All warning and cautions should be read carefully and strictly observed. Consult local, state, and national agencies regarding specific requirements and regulations. Address any safety, operation, and/or maintenance questions to your nearest Varian Vacuum Technologies office.

Solvents

CAUTION

The mechanical components of leak detectors are typically cleaned with alcohol, methanol, or other solvents. When heated, sprayed, or exposed to high-temperature equipment, these solvents become flammable and explosive, causing serious injury or death. Do not use these solvents near a high-temperature source. Ventilate the working area with a blower and work in a large, well-ventilated room.

Alcohol, methanol, or other solvents are irritants, narcotics, depressants and/or carcinogens. Their inhalation and/or ingestion may produce serious side effects. Prolonged or continued contact with the skin will result in absorption through the skin and moderate toxicity. Always ensure that cleaning operations are carried out in large, well-ventilated rooms, and wear eyeshields, gloves, and protective clothing.

CAUTION

Do not clean any aluminum parts with Alconox®. Alconox is not compatible with aluminum and will cause damage.

NOTE

During reassembly, always use Loctite® PST® (teflon-impregnated pipe thread compound) on pipe threads.

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Equipment, General

WARNING

Equipment tightness is guaranteed for normal operating conditions when the equipment leaves the factory. It is the user's responsibility to maintain the level of tightness particularly when pumping dangerous products.

CAUTION

The performance and operating safety of this equipment can only be guaranteed if it is operated according to normal conditions of use.

CAUTION

Always allow at least 4 inches of clearance adjacent to the ventilation holes at the front, back and bottom of the equipment enclosure.

Power and Static

WARNING

Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.

CAUTION

Varian strongly recommends the use of surge protection to improve the immunity of the 979 Series leak detectors against unidirectional transients caused by the following phenomena:

- *Switching phenomena in the power network (e.g., switching of capacitor banks)*
- *Faults in the power network*
- *Indirect lightning strokes*

CAUTION

Many components of the 979 are static sensitive devices. Varian Vacuum Technologies recommends that you wear a grounding device when performing any maintenance on the 979 and especially when performing maintenance of static sensitive parts.

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WARNING

This equipment is designed to meet current EEC regulations: LVD (Low Voltage Directive, 73/23/EEC) and EMC (Electromagnetic Compatibility, 89/336/EEC Directive) for Installation Category II, Pollution Degree II environment for Industrial, Scientific, Measuring and Process Control electrical equipment.

- ❑ Any modifications on the part of the user are liable to cause non-compliance with regulations or affect the EMC performance and the safety of the product. Varian Vacuum Technologies cannot be held responsible for consequences resulting from such intervention.
- ❑ The equipment can be damaged by incorrect mains AC supply voltages, the Radio Frequency (RF) and Electrostatic Discharge (ESD) energy inputs that can exceed the maximum ratings, operating in very high temperatures or without adequate ventilation, immersion in liquids, and physical abuse.
- ❑ All electrical connections must be performed by a qualified electrician and must comply with national and local codes.
- ❑ Ensure that the electrical installation conforms with your local safety requirements.
- ❑ Electrical installation must include the appropriate branch circuit (at least 20 A) with a long time delay and a reliable earth ground. Do not use an extension cord.
- ❑ Use only the power cord that was provided with your leak detector. The use of extension cords is not recommended and could result in damage to the equipment and loss of warranty.
- ❑ To avoid electric shock, connect the product power cord to a grounded power receptacle. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.
- ❑ Before powering the unit the first time, verify that the unit is configured to operate for the local mains supply voltage.
- ❑ Opening the enclosure may expose hazardous voltages. Always disconnect the power cord and interface cables before opening the enclosure. Do not touch the power inlet's contacts for at least 10 seconds after disconnecting the power cord.

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CAUTION

This equipment generates, uses, and can radiate RF energy and if not installed and used in accordance with the instructional manual, may cause harmful interference to radio communications.

When this equipment is operated in a commercial environment operation is subject to the following two conditions:

- ❑ This equipment may not cause harmful interference, and
- ❑ This equipment must accept any interference received, including interference (RF and ESD) that may cause undesired operation.

This equipment may need to be reset after RF and/or ESD events by cycling the Power Switch/Circuit Breaker on the back panel of the unit.

Operation of this equipment in a residential area is also likely to cause harmful radio communications interference in which case the user will be required to correct the interference at his own expense.

Vacuum Equipment and Cleanliness

Cleanliness is vital when servicing the leak detector or any vacuum equipment. There are some techniques that are more important in leak detector servicing than in general vacuum work:

CAUTION

Do not use silicone oil or silicone grease.

Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.

Do not clean any aluminum parts with Alconox®. Alconox is not compatible with aluminum and will cause damage.

NOTE

Normally, it is unnecessary to use vacuum grease. However, if it must be used, avoid silicone types, and use it sparingly. Apiezon® L grease is recommended (Varian Vacuum Technologies Part No. 695400004).

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O-ring Care

When removing, checking or replacing O-rings:

NOTE

Varian Vacuum Technologies recommends replacing all O-rings during routine maintenance or during any maintenance procedure requiring that O-rings be removed.

CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task. This prevents scratching of any sealing surfaces.

- *Wipe all O-rings clean with a lint-free cloth before installation to ensure that no foreign matter is present to impair the seal.*
- *Do not use grease or other substance on O-rings that will come in contact with the spectrometer tube.*
- *Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.*
- *If applicable, apply a small amount of Apiezon® L grease and wipe the O-rings "shiny" dry.*

NOTE

Due to the effective cleaning nature of VacuSolv solvent and its residue-free properties, Varian Vacuum Technologies' Component and Spectrometer Tube Cleaning Kit (Part Number 670029096), used in accordance with the kit instructions, is recommended for cleaning the spectrometer tube components. The kit can also be used for fine cleaning other parts in the leak detector's vacuum system such as valves and fittings. No rinsing steps or high-temperature drying is required following cleaning with VacuSolv. Although appropriate precautions are advised, VacuSolv is compatible with most materials and does not contain toxic chemicals or CFCs (chlorofluorocarbons).

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Spectrometer Tube

CAUTION *The spectrometer tube operates at a very high vacuum produced by the high vacuum pump. Service of the spectrometer tube requires that this vacuum be vented to the atmosphere.*

CAUTION *Do not use grease or other substance on O-rings that will come in contact with the spectrometer tube.*

CAUTION *If the spectrometer tube magnet comes in contact with a magnetic surface, the magnet may lose its gauss, causing the spectrometer tube to lose sensitivity.*

WARNING *Store the Ion Source in a cool, dry area in a tightly sealed container. Wash hands thoroughly after handling the Ion Source and especially before smoking or eating.*

Gross Leak Option

If the Gross Leak option is installed:

CAUTION *The Gross Leak is calibrated at the factory and if any alteration is made, the Gross Leak must be returned to the factory for recalibration. For returns, contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.*

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Pumps

WARNING

To avoid injury, use proper lifting techniques when moving pumps. Your system may have pumps that require two people to move them safely.

WARNING

The vacuum pumps are also compressors; incorrect operation may be dangerous. Study the "Mechanical Pump Operation Manual" enclosed with your pump before starting the pumps.

The pumps are designed to prevent any thermal risk for user safety. However, specific operating conditions may generate temperatures >70 °C.

Hot oil will burn the skin. Service of the pumps in this area must be performed by authorized personnel only. Stand back from mechanical pump before starting.

CAUTION

*Check the oil level often. Do not allow oil-based mechanical pumps to run when oil level is below **LOW** mark. Damage to pumps can occur if operated with no oil.*

WARNING

To avoid injury, wait until the turbo pump is completely stopped before disconnecting it from the vacuum system.

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Varian Services

The following are just a few of the many services that Varian offers its customers. Please see our catalog, or contact us to learn of the services that are available. Contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN for details.

- ❑ Rebuilt spectrometer tubes are available on an exchange basis.
- ❑ NIST-traceable calibrated leak testing and verification services.

Contacting Varian Vacuum Technologies

In the United States, you can contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

Internet users:

- ❑ Send email to Customer Service & Technical Support at vpl.customer.support@varianinc.com
- ❑ Visit our web site at www.varianinc.com/vacuum
- ❑ Order on line at www.evarian.com

See the back cover of this manual for a listing of our sales and service offices.

Tools Required for Component Replacement

The following tools are required for component replacement

- ❑ Phillips screwdriver
- ❑ Slotted screwdriver
- ❑ Long slotted screwdriver
- ❑ Crescent wrench
- ❑ PLCC chip extracting device, such as an AMP 821903-5
- ❑ 9-16 Wrench
- ❑ 13-16 Wrench
- ❑ 11-32 Nut driver
- ❑ 5-64 Allen wrench
- ❑ A non-metal device for removing O-rings

Materials (not Parts) Required for Component Replacement

- ❑ Powder-free butyl or polycarbonate gloves
- ❑ Clean, non-magnetic surface
- ❑ Lint-free wipes
- ❑ VacuSolv or similar solvent
- ❑ Cotton swabs
- ❑ Loctite PST 565 Thread Sealant

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Preface

This manual contains information for field replacement of components of the Model 979 Mass Spectrometer Helium Leak Detector. It is organized so that similar items or procedures are included in a section. The manual moves from a brief overview of the leak detector to specific replacement procedures to calibration and tuning procedures that must be run after the replacement of certain components. Photographs are liberally used to help document procedures. An appendix provides Assembly Drawings and Bills of Materials for reference. The specific sections included in the manual are:

Preface	Contains information relevant to the remainder of the manual.
Section 1 “System Overview”	A brief overview of the 979.
Section 2 “Cleaning the Test Port”	How to clean the test port.
Section 3 “Removing the Covers from the 979”	How to open individual sections or all of the 979 covers.
Section 4 “The Internal Calibrated Leak”	Detailed steps for removing and replacing the calibrated leak.
Section 5 “Spectrometer Tube Assembly”	Spectrometer tube assembly procedures from replacement as an assembly to replacement of individual components. This section also includes a full overhaul procedure.
Section 6 “Test Port Thermocouple Gauge”	How to access and replace the test port thermocouple gauge.
Section 7 “The Varian Platform”	Procedures to access and replace the printed circuit boards that make up the Varian Platform.
Section 8 “Internal High Speed Turbo and Mechanical Pumps”	Replacement of the turbo pump and the mechanical pumps.
Section 9 “Calibration and Manual Tuning”	Procedures that must be completed after replacement of certain components.
Section 10 “Leak Checking for Reliability”	General information regarding testing for leaks after component replacement.
Section A “Assembly Drawings and Bills of Materials”	Assembly drawings and Bills of Materials for reference.
Section B “979 COM Cable”	979 COM Cable sketch and pinout assignments.
Section C “979 Spare Parts List”	A table of the 979 Spare Parts List with ordering numbers.

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Section 1. System Overview

The Varian Model 979 is a portable wide-range Helium Mass Spectrometer Leak Detector. It is comprised of a turbomolecular high vacuum pump, spectrometer tube, valve block, Varian Vacuum Technologies' Platform leak detector electronics, and an operator interface in a rugged housing. The 979 is available as a stand-alone, bench-mount unit or as a single or dual, dry or oil sealed mechanically pumped leak testing station on a cart.

The 979 uses Varian Vacuum Technologies' Platform leak detector electronics architecture to operate the spectrometer assembly, control the mechanical and high vacuum pumps, control the valve block, and provide leak rate and system status information to the operator interface. The Platform is a collection of printed circuit boards that operate using the PC/104 Bus Structure to perform the various functions of a helium mass spectrometer leak detector.

1.1 Front Panel Displays and Controls

The 979 front panel leak rate display and control buttons are located on the front right-hand side of the leak detector (Figure 1-1). The panel features large, color coded and clearly labeled buttons, and a large, easy to read bar graph display.

A touch panel display for the initial setup and configuration of the leak detector is located on the left of the front panel. The touch panel menus also include some service operations. If you need additional information about operations of the 979, see the *Model 979 Instruction Manual*.

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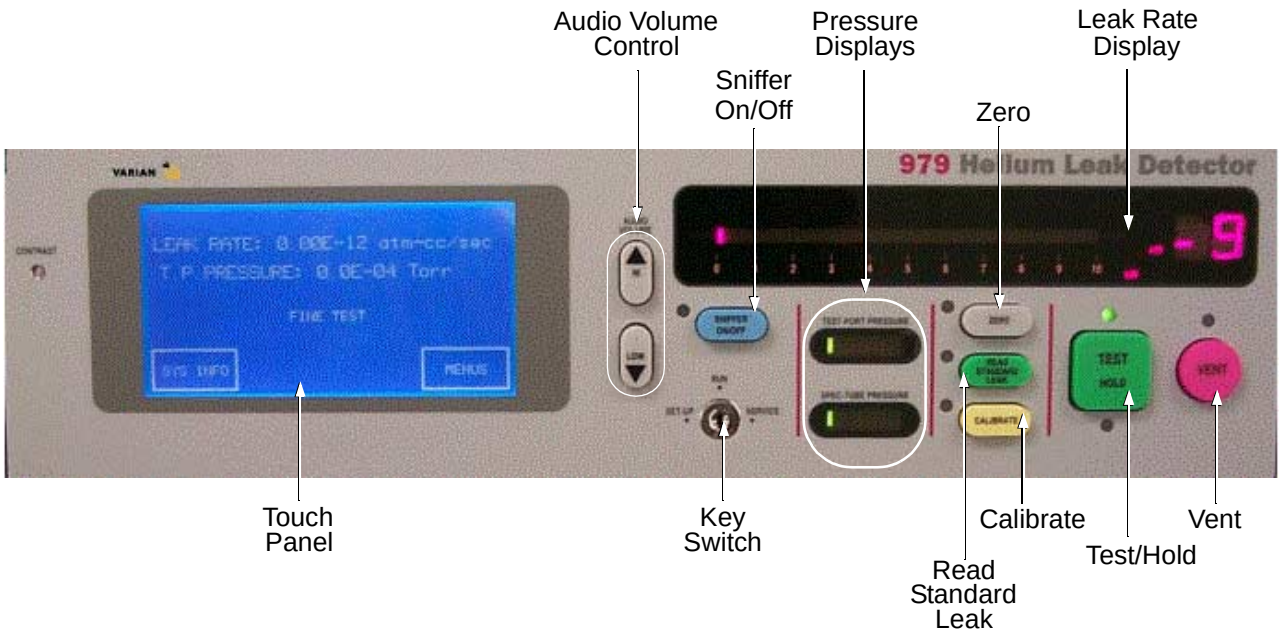

Figure 1-1 979 Front Panel Displays and Controls

1.1.1 Key Switch

The 979 Key Switch allows three different levels of access to the touch panel system controls—RUN, SET-UP or SERVICE. Two different keys are provided with the leak detector:

- Key T009 operates the switch in RUN, SET-UP or SERVICE positions.
  The T009 key is intended for service personnel and those who are very familiar with the operation of the unit. Operations such as manually changing the valves can only be performed when the key switch is in the SERVICE position. No changes to the operating parameters are allowed when the key switch is in the RUN position.
- Key T008 operates the switch in either the RUN or SET-UP positions.
  The T008 key is intended for use by a line supervisor or engineer and allows most parameters to be changed, but does not allow any operation that could damage the unit. No changes to the operating parameters are allowed when the key switch is in the RUN position.

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1.2 Rear Panel

The rear panel of the 979 (Figure 1-2) includes power and communications connections as well as a manifold for connection to a mechanical pump.

Figure 1-2 979 Rear Panel

1.2.2 System Control and Communication Panel

The system control and communication panel (Figure 1-3) is located on the lower left section of the rear panel.

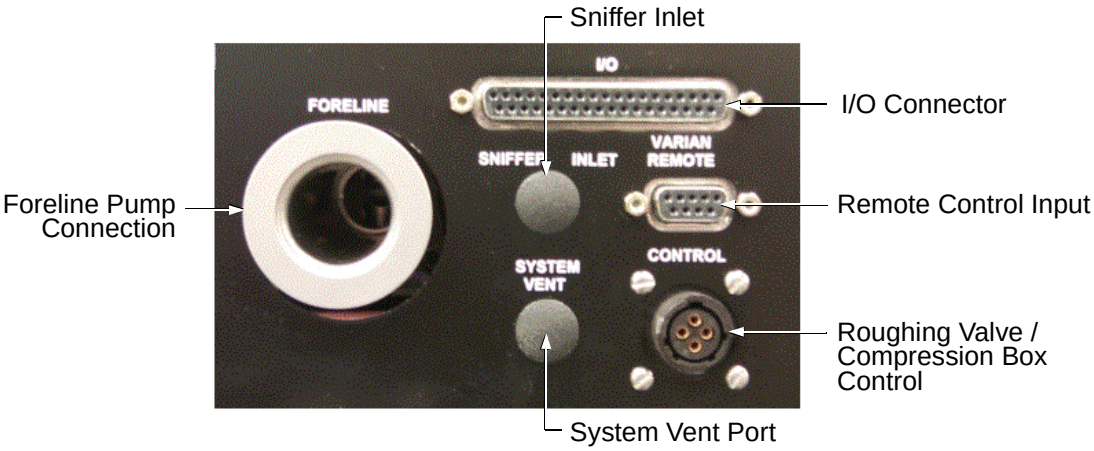

Figure 1-3 979 System Control and Communication Panel

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1.3 Inside the Model 979

1.3.1 Inside Front View

Most serviceable parts are accessed from the front of the leak detector (Figure 1-4).

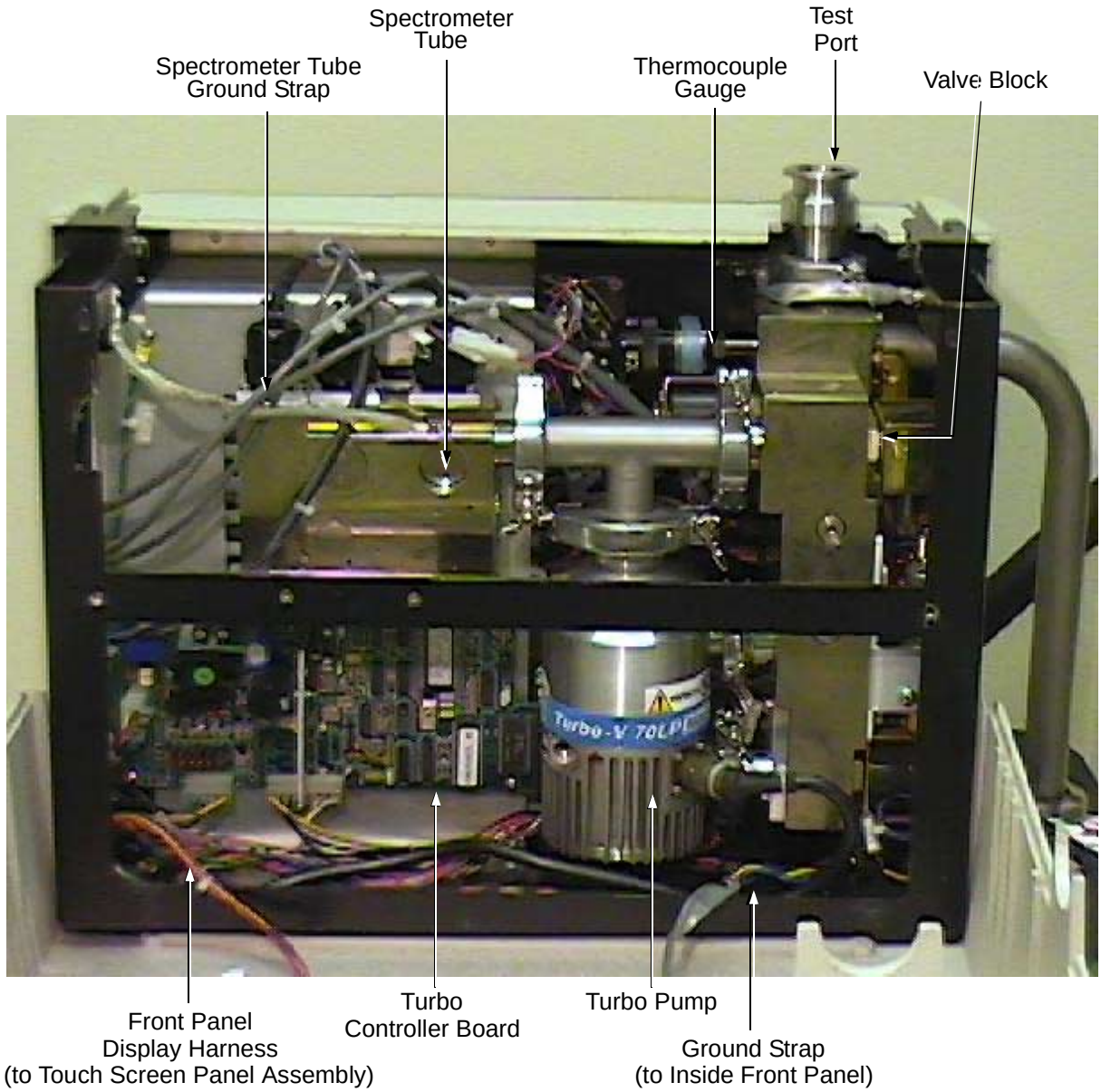

Figure 1-4 979 Interior: Front View

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1.3.2 Side View — Card Cage Side

The left side of the 979 provides access to the card cage (Figure 1-5).

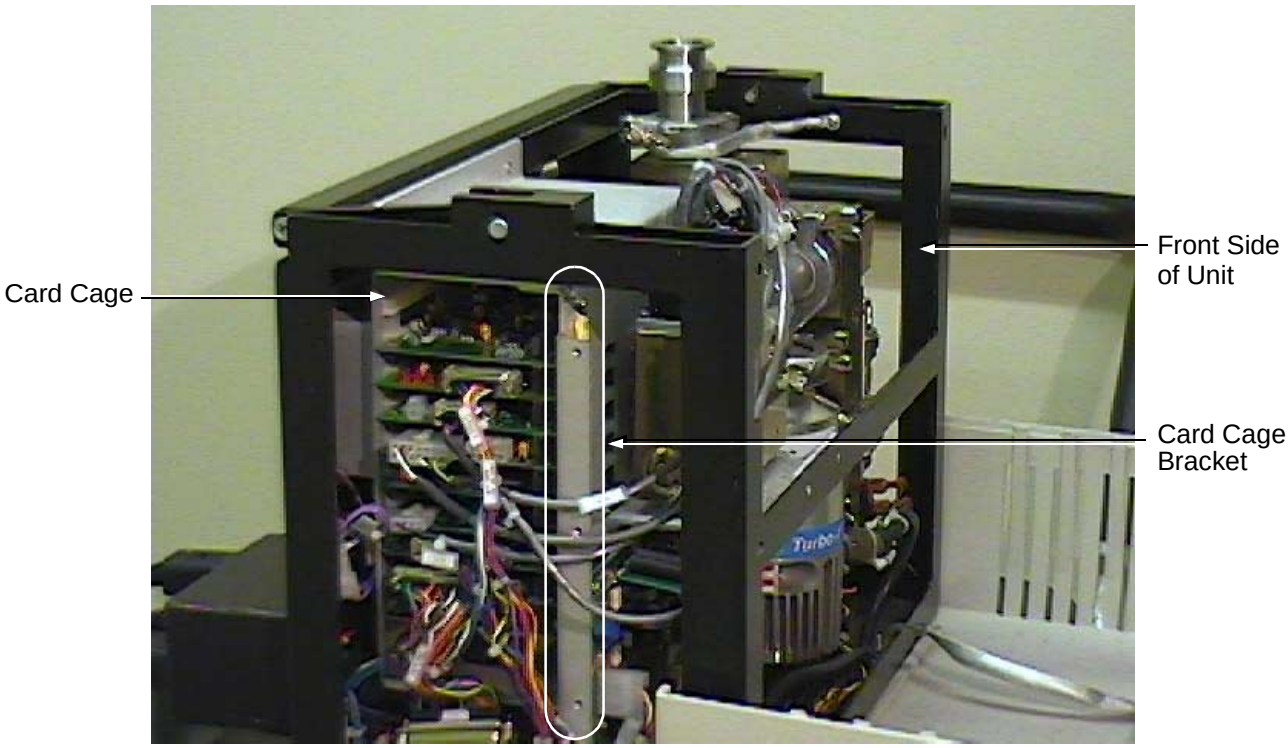

Figure 1-5 979 Interior: Side View Card Cage

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1.3.3 Side View — Calibrated Leak, Valve Block Side

The right side of the 979 allows access to the Internal Calibrated Leak (option) (Figure 1-6).

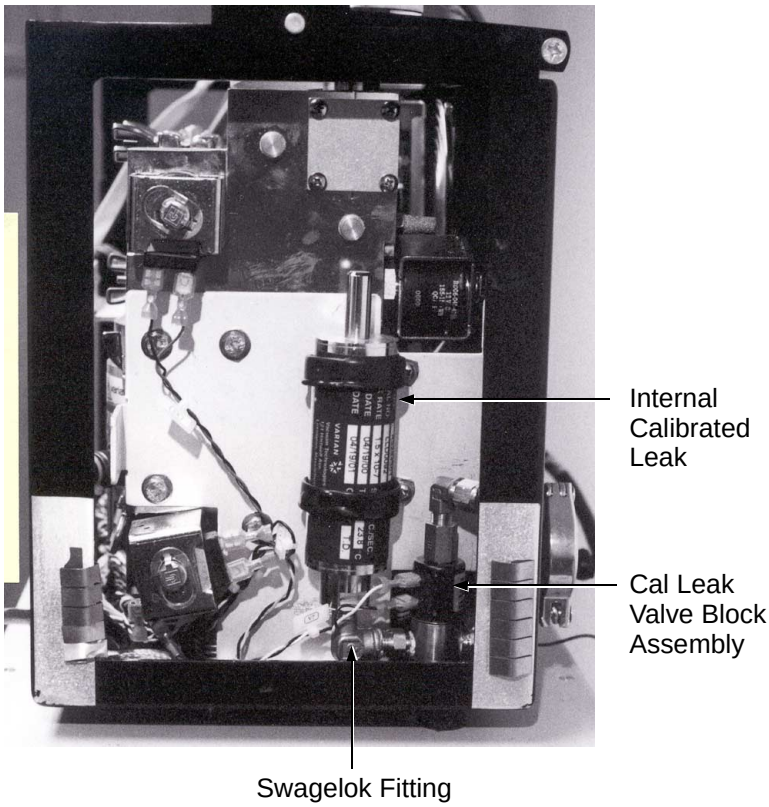

Figure 1-6 979 Interior: Side View Valve Block and Internal Calibrated Leak

1.3.4 Rear View

There are no field serviceable parts on the back of the 979 under the rear panel.

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Section 2. Cleaning the Test Port

The test port is located on the outside of the Model 979 leak detector. Therefore, it is not necessary to turn the leak detector off or disconnect it from mains power if this is the only procedure being performed. If you are cleaning the test port in conjunction with other procedures that require opening the leak detector, be sure to turn the leak detector off and disconnect it from mains power.

The NW25 uses the blank-off flange cap on top of the centering ring when the system is not in use or when in use but not connected to a device.

To clean the test port:

1. Turn the test port wing nut counterclockwise to loosen it (Figure 2-1), remove the quick clamp (Varian p/n KQ25AWP) from the test port, and remove any connected devices.

CAUTION *Be careful not to drop the test port blank-off flange cap when you remove the test port tightening nut. It is deceptively heavy for its size.*

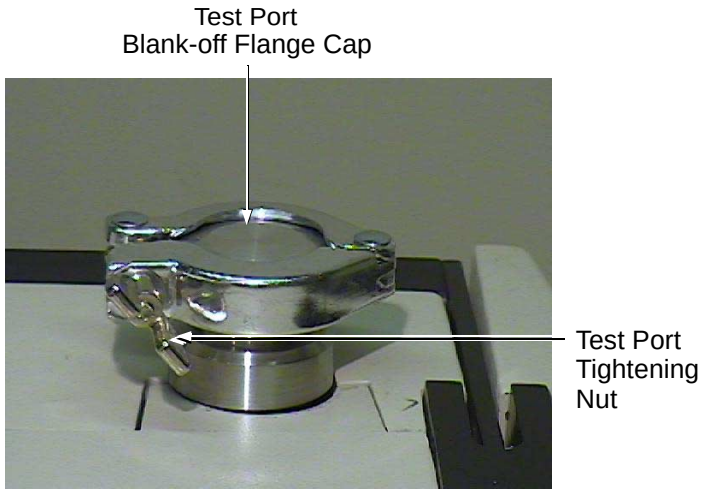

Figure 2-1 Test Port with Blank-Off Flange Cap

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2. Remove the test port blank-off flange cap and/or centering ring from the top of the test port (Figure 2-2).

Figure 2-2 Centering Ring with O-ring

3. Remove the O-ring from the centering ring.
4. Examine the O-ring for wear.

   If necessary, use a new O-ring, otherwise clean the O-ring.

NOTE

Varian Vacuum Technologies recommends replacing all O-rings during routine maintenance or during any maintenance procedure requiring that O-rings be removed.

CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task. This prevents scratching of any sealing surfaces.

Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.

Wipe all O-rings clean with a lint-free cloth before installation to ensure that no foreign matter is present to impair the seal.

If applicable, apply a small amount of Apiezon L grease and wipe the O-rings “shiny” dry.

5. Examine all parts of the test port, including inside the test port.

   In necessary, use a VacuSolv wipe to remove any dirt or foreign matter and allow parts to air dry.
6. Place the O-ring into the groove of the centering ring.

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7. Place the centering ring onto the top of the test port (Figure 2-3).

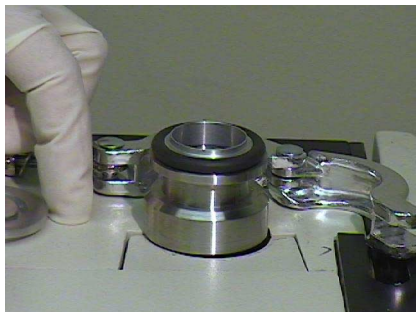

Figure 2-3 O-ring and Centering Ring on Test Port

8. Replace the blank-off flange cap or connected device.
9. Replace the quick clamp onto the test port and tighten the wing nut clockwise until it is just tight enough to stay in place.

   Figure 2-4 shows the system with a connected device.

Figure 2-4 Test Port with Connected Device

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Section 3. Removing the Covers from the 979

There are three main covers that enclose the Model 979 leak detector:

- ❑ Front Panel
- ❑ Rear Panel
- ❑ Left Side Panel

The front and rear panels can be removed independently of each other. If you have to remove the side panel to get to the card cage, you must remove the front panel, the rear panel and the side panel in that order.

3.1 Opening the Front Panel

To open the Model 979 front panel:

1. Disconnect the mains power supply and make sure all pumps are off.

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

2. Remove the 2 Phillips screws from the 979 front panel (Figure 3-1).

Figure 3-1 979 Front Panel

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3. Lean the top of the front panel forward.

CAUTION *Be careful not to place tension on the front panel display PCB harness.*

4. If it is not already supported on a bench, support the front panel with one hand and press the release tab on the white molex connector (Figure 3-2) located on the touch panel assembly and pull it to disconnect the PCB harness.

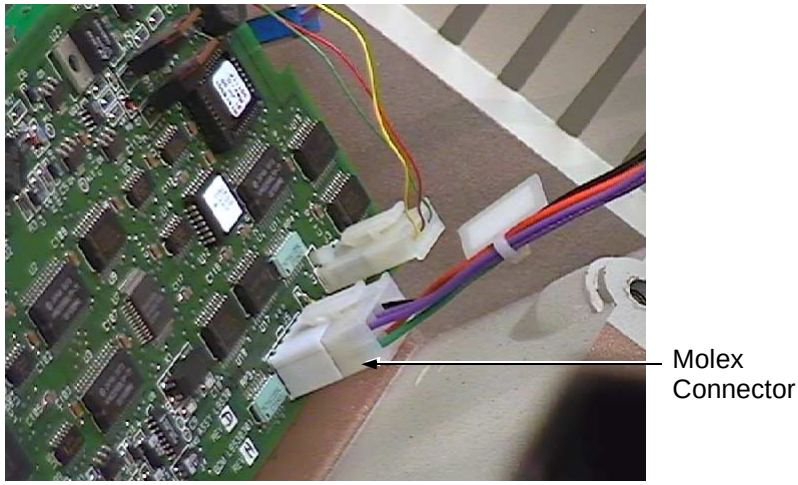

Figure 3-2 Molex Connector on Touch Panel Assembly

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3.2 Removing the Front Panel

To remove the front panel:

1. Open the front panel as described in Section 3.1 “Opening the Front Panel”.

   The ground strap, which must be removed, is located in the right bottom corner of the front panel (Figure 3-3).

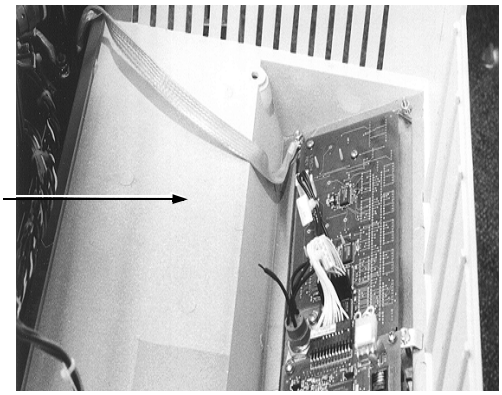

Figure 3-3 Front Panel Ground Strap

2. Using a 11-32 nut driver, remove the 8-32 nut that holds the ground strap (Figure 3-4).

Figure 3-4 Ground Strap Removal from Front Panel

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3. If it is not already supported on a bench, support the front panel with one hand and lift the ground strap up and away from the screw post it is on.
4. Remove the front panel and place it in a safe place where damage cannot occur to the front panel displays, buttons, or to the touch panel assembly PCB located inside the front panel.

CAUTION *Although the Touch Screen Panel is made of industrial-strength glass and is highly durable, it can be broken if it is hit sharply.*

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3.3 Removing the Rear Panel

To perform this procedure:

1. Disconnect the mains power supply and make sure all pumps are off.

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

2. Remove the 4 large Phillips screws located on each corner of the rear panel (Figure 3-5).

Figure 3-5 Rear Panel Removal

3. Lift the handle up.
4. Remove the panel and put it in a safe place.

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3.4 Removing the Side Panel

To remove the side panel:

1. Open and remove the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1 and Section 3.2 “Removing the Front Panel” on page 3-3.
2. Remove the rear panel as described in Section 3.3 “Removing the Rear Panel” on page 3-5.
3. Back out one of the silver Phillips screws on the black vented side panel (Figure 3-6).

Figure 3-6 Side Panel Removal

4. Slide the screw toward the center of the panel.

   This moves the latch from under the chassis and disengages this side of the panel.
5. Support the panel with one hand and back out the other screw on the side panel.
6. Slide the screw toward the center, moving the latch from under the chassis.

   The panel disengages, completely exposing the card cage.
7. Place the panel where it will not get damaged.

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3.5 Replacing All Covers and Panels

Each of the procedures in this section is complete for its stated purpose. If all panels and covers have been removed, however, they must be replaced in the order given in this procedure.

3.5.1 Replacing the Side Panel

To replace the side panel:

1. Place the panel on the side with the card cage oriented so the screws are up and facing you.
2. Support the panel and insert a Phillips screwdriver into one of the silver screws.
3. Slide the screw toward the outside of the panel to move the latch under the chassis.
4. Tighten the screw.
5. Repeat for the other side of the panel.

3.5.2 Replacing the Rear Panel

To replace the rear panel:

1. Place the rear panel onto the chassis, fitting the top under the port nut.
2. Replace and tighten the 4 Phillips screws located in each corner of the panel.

3.5.3 Replacing the Front Panel

To replace the front panel:

1. Support the panel with one hand, if it is not already supported on a bench.
2. Align the bottom of the panel with the bottom of the leak detector, leaving it propped open.
3. Place the grounding strap over the screw post.
4. Place the 8-32 nut onto the screw post and tighten it using an 11-32 nut driver.

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5. Lift the panel towards the leak detector and insert the white PCB harness molex connector plug into the connector located on the touch panel PCB assembly (Figure 3-7).

NOTE *Be sure the white PCB harness molex connector plug clicks into place securely.*

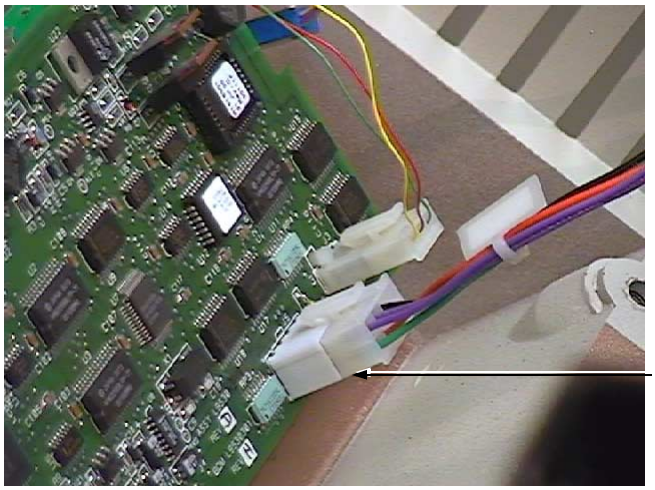

Figure 3-7 Front Panel PCB Harness Connector

CAUTION *Be careful not to place tension on the front panel display PCB harness.*

6. Raise the panel until it is closed, fitting the top under the port nut and making sure that it fits securely with the rear panel, and that it is not pinching any wires.
7. Replace and tighten the 2 Phillips screws on the front of the panel.

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Section 4. The Internal Calibrated Leak

4.1 Recalibrating the Internal Calibrated Leak

Helium calibrated leaks typically degrade at 3 percent per year. The calibrated leak supplied with your 979 must be checked at least once a year to ensure it is at the value stated on its tag. Failure to check the leak could result in unreliable testing. You can arrange for testing and recalibration at a lab of your choice.

Varian Vacuum Technologies provides NIST-traceable calibrated leak testing and verification services. You can contact Customer Service at 1-800-8VARIAN to arrange for recalibration.

4.2 Replacing the Internal Calibrated Leak

The Internal Calibrated Leak is located such that the Valve Block Coil and Plunger Assembly must be removed (Figure 4-1) to have room to remove the calibrated leak.

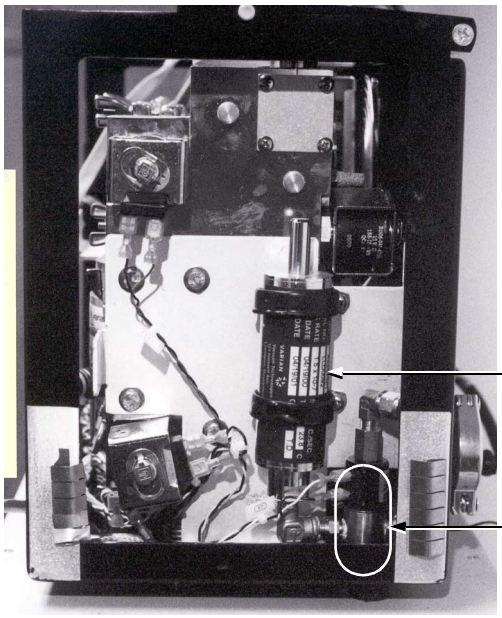

Figure 4-1 979 Side View: Removal of Valve Block Coil and Plunger Assembly

CAUTION

If the Gross Leak option is installed:
(1) Do not make any alterations to the Gross Leak. Do not touch the knurled nut on the Gross Leak.
(2) The Gross Leak is calibrated at the factory and if any alteration is made, the Gross Leak must be returned to the factory for recalibration. For returns, contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

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4.2.1 Removing the Valve Block Coil and Plunger Assembly

To remove the Valve Block Coil and Plunger Assembly:

1. Disconnect the mains power supply and make sure all pumps are off.

WARNING *Disconnect power from the 979 before performing any procedure that requires physically disconnecting any part of the system.*

2. Open the front and rear panels (Figure 4-2) as described in Section 3.1 “Opening the Front Panel”.

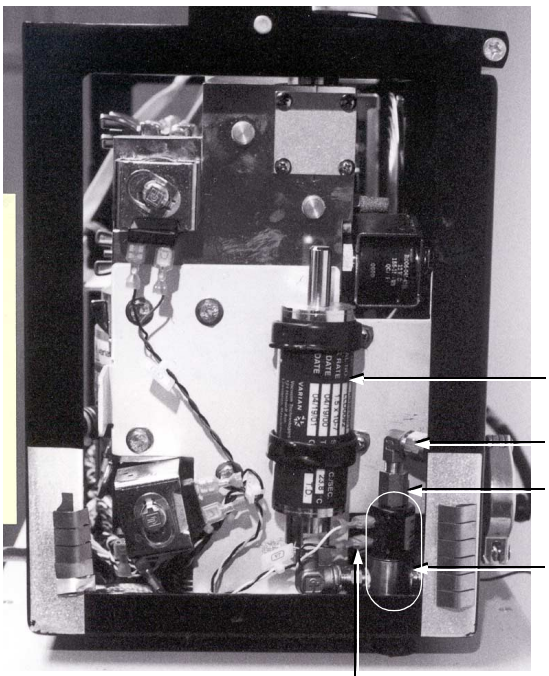

Figure 4-2 979 Side View

CAUTION *Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.*

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3. Loosen and remove the end cap from the valve stem (Figure 4-3) using a 9-16 wrench.

NOTE

Be careful not to drop or lose the black sleeve located inside the end cap.

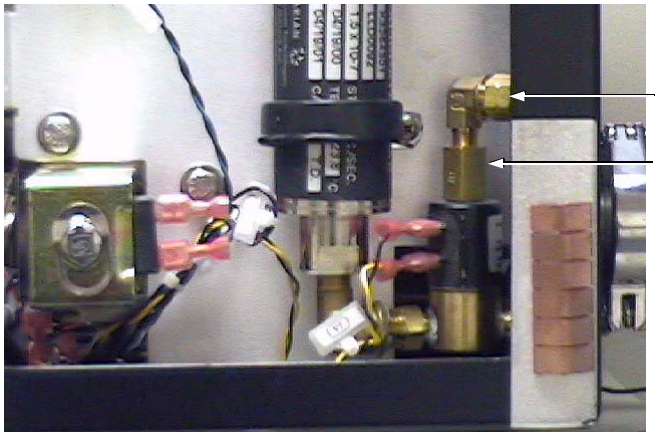

Figure 4-3 End Cap and Valve Stem

Figure 4-4 shows the Valve Stem with the end cap removed.

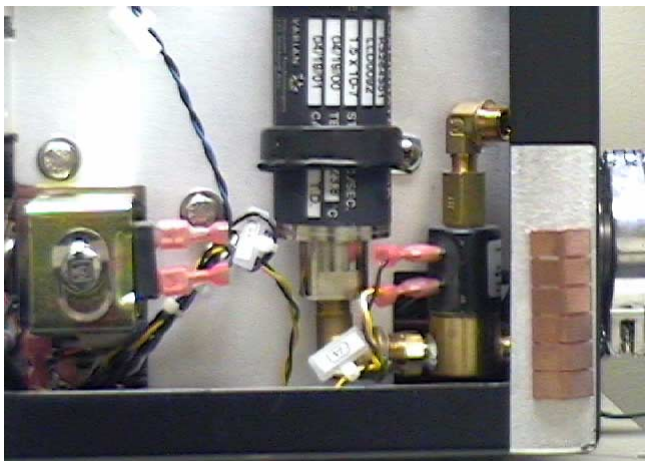

Figure 4-4 Valve Stem with End Cap Removed

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4. Use a 9-16 wrench to loosen the valve stem (Figure 4-5), then rotate the connection counterclockwise until you hit the stop.

   Reposition the wrench and repeat. When it is loose enough, you can finish removing it by hand.

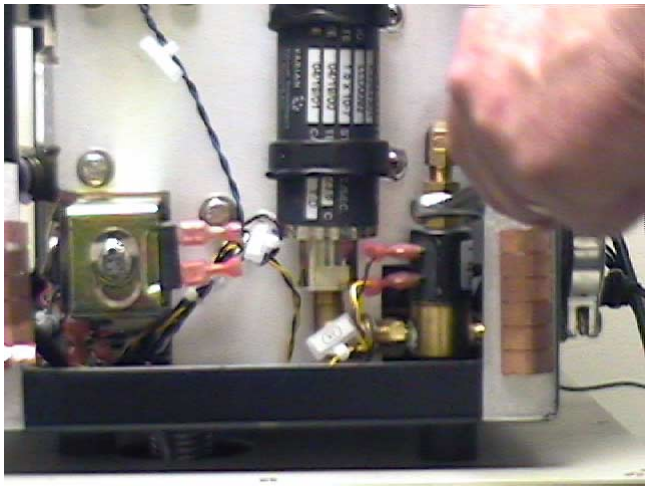

Figure 4-5 Valve Stem Removal

5. Disconnect the 2 pink valve block power connectors (Figure 4-6), labeled V7, that have black and yellow wires.

Figure 4-6 V7 Valve Block Power Connector Removal

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6. Being careful not to scratch the valve block, insert a long slotted screwdriver through the top of the leak detector down to the slotted post on the top of the coil and plunger assembly (Figure 4-7).

Figure 4-7 Slotted Post on Coil and Plunger Assembly

7. Holding the coil with one hand so it doesn't spin (Figure 4-8), loosen the coil and plunger assembly using the long slotted screwdriver.

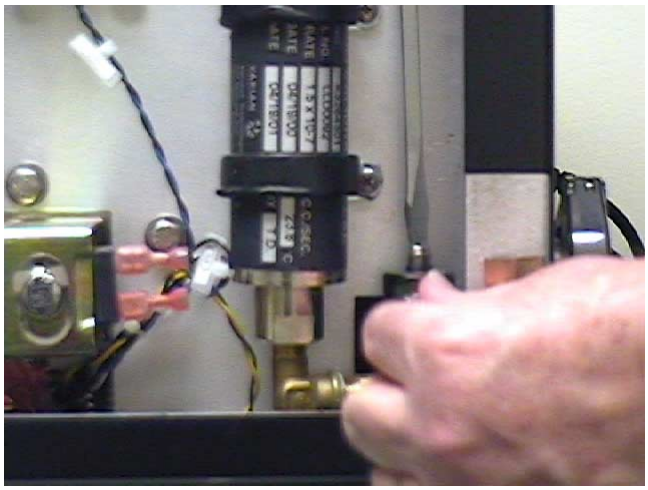

Figure 4-8 Securing the Coil to Loosen Plunger Assembly

CAUTION

The plunger is located on the bottom of the coil and plunger assembly. It has a spring. Be careful not to drop the plunger into the leak detector.

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8. Lift the coil and plunger assembly away from the cal leak valve block, and slip your other hand or finger under the bottom of the assembly so the plunger that is located at the bottom of the coil does not fall.
9. Place the coil and plunger assembly aside.

Once the coil and plunger assembly is removed, the calibrated leak can be removed. Refer to Section 4.2.4 “Examining and Cleaning the Valve Block Coil and Plunger Assembly” on page 4-11 before reassembling.

4.2.2 Removing the Internal Calibrate Leak

To remove the Internal Calibrated Leak:

CAUTION *Handle the calibrated leak carefully. It is a delicate piece of equipment that contains a glass liner that can break if it is dropped or hit sharply.*

1. Remove the 2 large Phillips screws that hold the calibrated leak straps (Figure 4-9).

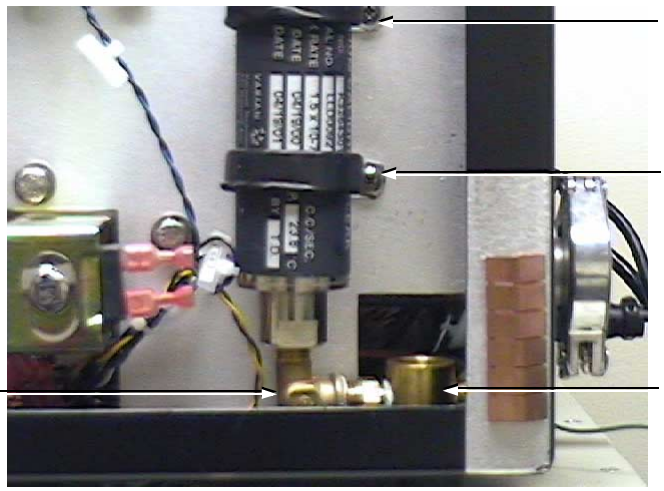

Figure 4-9 979 Side View: End Cap, Valve Stem, and Coil and Plunger Assembly Removed

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2. Remove the straps by sliding them up and over the top of the calibrated leak.
3. Hold the flats of the nut on the swagelok fitting (elbow) below the calibrated leak with a crescent wrench (Figure 4-10).

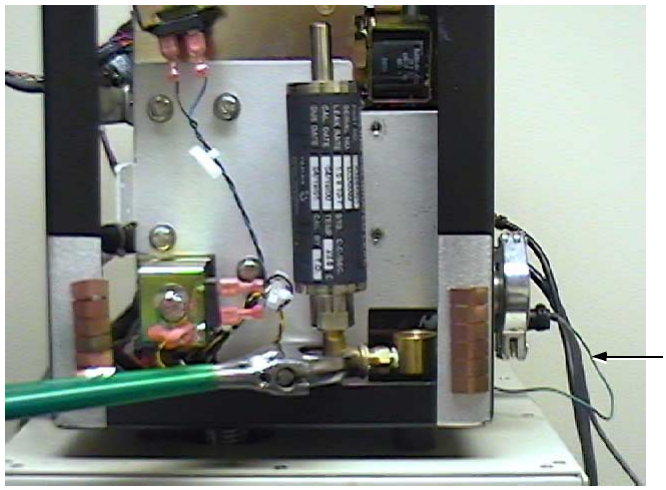

Figure 4-10 Elbow Flat Secured with Crescent Wrench

NOTE

Figure 4-10 (and others that follow) show the side panel of a leak detector that is using a dry pump. It is connected to a compression box and the wire supplies valve logic. If your leak detector is not a dry configuration, you will not use a compression box and will not see this connection.

4. Using a 13-16 open wrench, place it on the flats of the calibrated leak (Figure 4-11) and rotate the leak counterclockwise until you hit the stop.

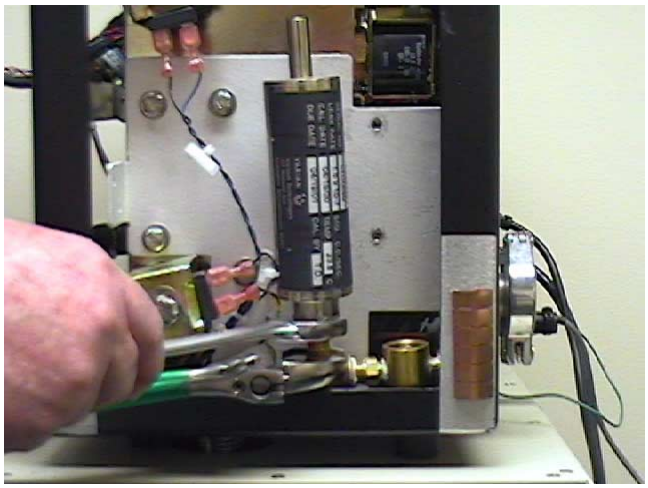

Figure 4-11 Loosening Leak with Open Wrench

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5. Reposition the wrench and repeat this action until the leak is loose enough to finish loosening it by hand (Figure 4-12).

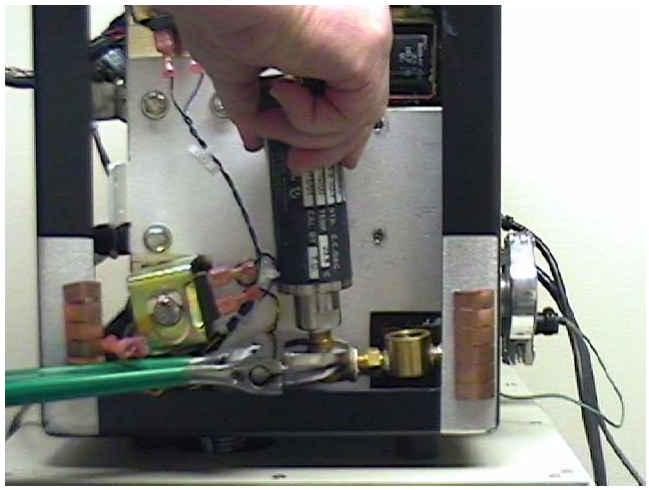

Figure 4-12 Removal of Calibrated Leak

CAUTION *Handle the calibrated leak carefully. It is a delicate piece of equipment that contains a glass liner that can break if it is dropped or hit sharply.*

6. Lift the calibrated leak up and off of the elbow.
7. Determine which replacement plan you have, and take the appropriate action:
   - ❑ Return the leak to Varian for recalibration
   - ❑ Return the leak to Varian for replacement as part of the replacement program
   - ❑ Send the leak to the NIST lab of your choice for recalibration

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4.2.3 Replacing the Internal Calibrated Leak

To replace the internal calibrated leak:

CAUTION *Be careful not to get any Loctite PST 565 into the valve or in the small hole in the valve. The valve can become plugged, resulting in unreliable leak detection.*

The threads of the swagelok fitting that the calibrated leak connects to will have the remnants of Loctite PST 565 Thread Sealant (Figure 4-13).

1. Clean the threads using acetone or isopropyl alcohol, or a VacuSolv wipe or VacuSolv liquid on a lint-free cloth.

   Allow to air dry before proceeding to the next step.

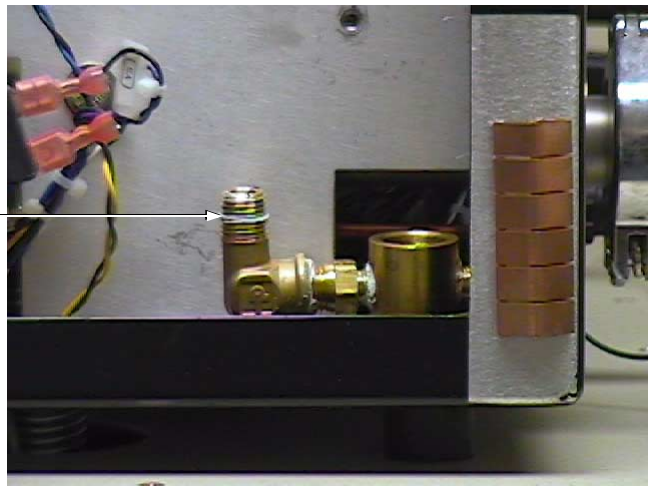

Figure 4-13 Elbow after Removal of Calibrated Leak

2. Being careful not to get any in the valve, place a small amount of Loctite PST 565 Thread Sealant onto the first two threads of the swagelok fitting.
3. Place the internal calibrated leak onto the swagelok fitting and hand tighten.

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4. Position a crescent wrench on the flats of the swagelok fitting (Figure 4-14), hold it still and finish tightening the calibrated leak using a 13-16 open wrench.

   Be sure the calibrated leak is oriented so that information on the label can be read without having to disturb it.

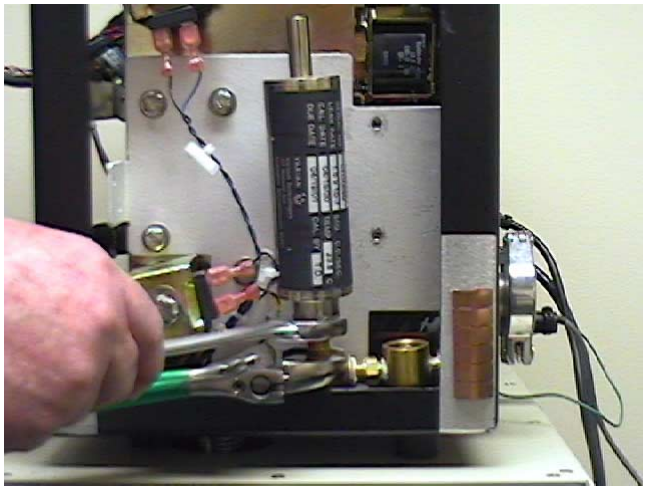

Figure 4-14 Connecting Leak with Open Wrench

CAUTION *Be careful not to overtighten the leak, but be sure the calibrated leak is completely seated on the swagelok fitting.*

5. Place the holding straps over the top of the calibrated leak and position them so the ends are over the screw holes (Figure 4-15).

Figure 4-15 Calibrated Leak Strap Replacement

6. Insert the screws and tighten them completely.

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4.2.4 Examining and Cleaning the Valve Block Coil and Plunger Assembly

The various parts of the Valve Block Coil and Plunger Assembly must be examined and cleaned before reassembling the valve.

4.2.4.1 Examining and Cleaning the Cal Leak Valve Block

To examine and clean the cal leak valve block:

1. Locate the O-ring inside the cavity of the cal leak valve block that accepts the coil and plunger assembly.

NOTE

If possible, replace O-rings during routine maintenance or during maintenance procedures that requiring the removal of O-rings.

CAUTION

Do not use a metal instrument to remove the O-ring.

Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.

Always wipe O-rings with a lint-free cloth before installation to ensure that no foreign matter is present to impair the seal.

If applicable, apply a small amount of Apiezon L grease and wipe the O-rings “shiny” dry.

2. Carefully remove the O-ring, and examine it for dirt and wear.
3. If the cavity is dirty, use a lint-free cloth or VacuSolv wipe to clean it and allow it to air dry.
4. Place the O-ring into the cavity and verify that it is fully seated.

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4.2.4.2 Examining and Cleaning the Coil and Plunger Assembly

The plunger has elastomer at the top and at the bottom. This elastomer helps to form the seal when the valve closes. It must be kept clean and free of debris. Do not use any solvent that will dry out the elastomer.

CAUTION *Do not use alcohol, methanol or other solvents on the elastomer parts of the plunger. To clean it, wipe with a dry lint-free cloth only.*

To examine and clean the coil and plunger assembly:

1. Pull the plunger out of the coil, being careful not to drop any part.
2. Examine the top of the plunger for wear and debris (Figure 4-16).
3. Wipe it clean using a dry lint-free cloth.

Figure 4-16 Top of Plunger

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4. Examine the bottom of the plunger (Figure 4-17) for wear and debris and wipe off any debris using a dry lint-free cloth, being careful not to lose the spring.

Figure 4-17 Bottom of Plunger

5. Examine the cavity of the coil making sure it is clean and that the small hole is not plugged.
6. Wipe the cavity using a cotton swab that has been dipped in isopropyl alcohol.
7. Place the plunger back into the coil.

4.2.4.3 Examining and Cleaning the Valve Stem and End Cap

To examine and clean the valve stem and end cap:

1. Examine the valve stem inside and out.
2. Blow compressed air through the valve stem to be sure it is not blocked.
3. Wipe the outside of the valve stem clean using a lint-free cloth or, if necessary, using VacuSolv, and allow it to air dry.
4. Repeat step 3 for the end cap.

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4.2.5 Replacing the Coil and Plunger Assembly

The final steps of replacing the internal calibrated leak include replacing the coil and plunger assembly, the valve stem, and the end cap.

To replace the coil and plunger assembly:

1. If it is not there already, place the plunger into the coil.
2. Hold the coil and plunger assembly with one finger placed to hold the plunger in place.

CAUTION *If you press the spring and inadvertently let it go, the plunger could shoot into the leak detector. Do not press the spring, just hold it in place.*

3. Turn the coil and plunger assembly over, place it into the cal leak valve block, and hold it upright. (Figure 4-18).

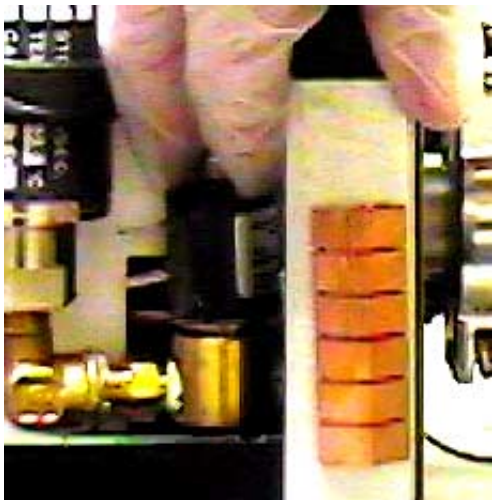

Figure 4-18 Placement of Plunger Assembly into Coil

CAUTION *Take care not to bump the sides to avoid getting small metal chips on the O-ring.*

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4. Carefully thread the coil by hand until it is tight enough to be held on its own.
5. Being careful not to scratch the valve block, insert a long slotted screwdriver through the top of the leak detector down to the slotted post (Figure 4-19) on the top of the coil and plunger assembly.
6. Hold the coil in place with one hand so it doesn't spin, position the coil so that the terminals are angled out (Figure 4-19) to receive the power connections, and turn the post using the screwdriver until the plunger assembly is secured.

   Do not overtighten.

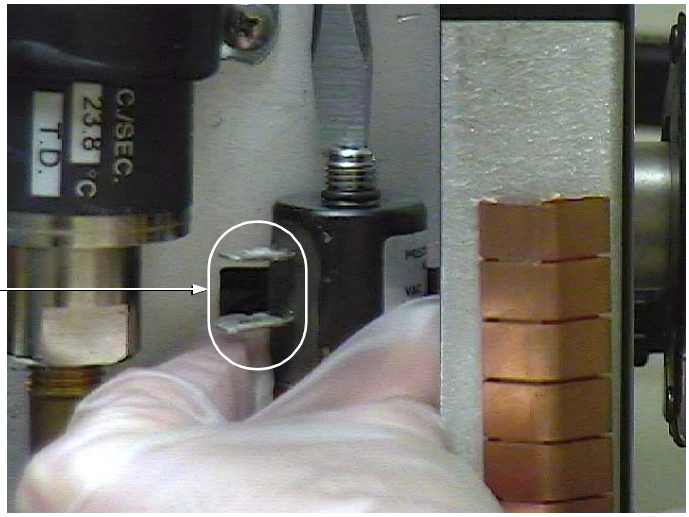

Figure 4-19 Coil and Plunger Assembly Replacement

7. Place the valve stem onto the post on the top of the coil (Figure 4-20) and tighten it until the valve stem is snug.

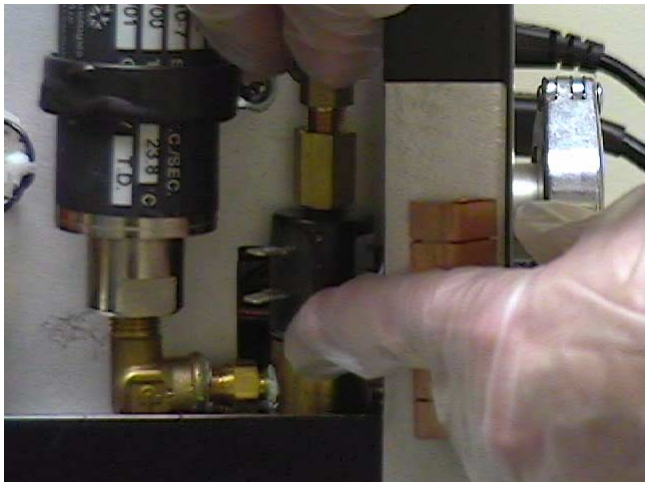

Figure 4-20 Positioning Valve Stem onto Coil and Plunger Assembly

The top fitting should be angled out towards the side so it can be accessed, but not so far out that it interferes with the covers being replaced (Figure 4-21 on page 4-16).

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8. Place the end cap onto the valve stem and using a 9-16 wrench tighten it until it is just snug (Figure 4-21).

Figure 4-21 End Cap Replacement

9. Reconnect the valve block connections labeled V7, placing the connector with the yellow wire onto the upper connection and the connector with the black wire onto the lower connection.
10. Replace the rear and front panels as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
11. Reconnect mains power.
12. Turn on the leak detector power switch.
13. When the pumps are up to speed and warmed up, enter the value of the new internal calibrated leak, if it is different than the one that was just removed, using the CAL LEAK SET-UP screen.

NOTE

If you need additional information about entering the value of the internal calibrated leak or performing a calibration, see the Model 979 Instruction Manual.

14. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
15. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

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Section 5. Spectrometer Tube Assembly

5.1 Spectrometer Tube Exchange

The entire spectrometer tube, including preamplifier, ion source and Button TC, can be replaced as one unit.

NOTE *Rebuilt spectrometer tubes are available from Varian Vacuum Technologies on an exchange basis. Contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN for details.*

CAUTION *Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.*

5.1.1 Removing the Spectrometer Tube Assembly for Complete Exchange

To remove and replace the spectrometer tube assembly:

1. Disconnect the mains power supply and make sure all pumps are off.

   WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

   The spectrometer tube operates at a very high vacuum produced by the high vacuum pump. Service of the spectrometer tube requires that this vacuum be vented to the atmosphere.

2. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1 and remove the spectrometer tube.

   It is not necessary to remove the front panel completely, however take care not to place tension on the front panel display PCB harness.

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3. Vent the spectrometer tube (Figure 5-1) by turning the knurled nut on the turbo pump (knurled nut not shown in this view) approximately 1/4 turn counterclockwise.

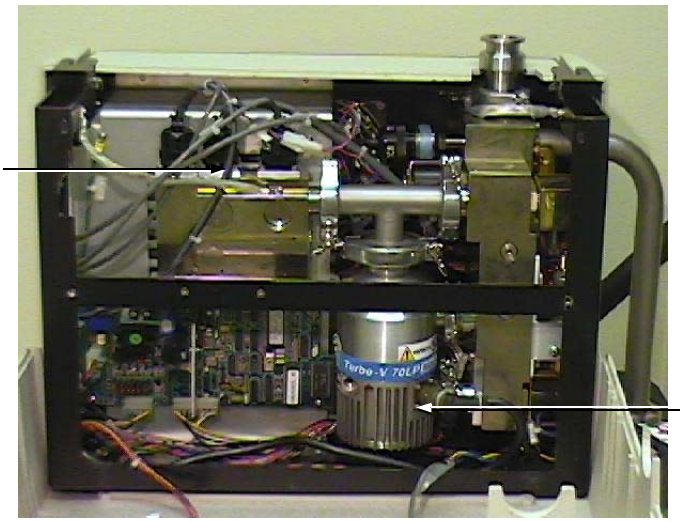

Figure 5-1 Spectrometer Tube and Turbo Pump

In addition to the three connectors on the top of the unit (Figure 5-2) and the ground cable, the spectrometer tube is attached by an NW-25 quick clamp and a wing nut located below the tube (not shown in this view).

4. Remove the three connectors from the top of the spectrometer tube shown in Figure 5-1 by grasping the plug and gently pulling it straight up and off of the contact pins (Figure 5-2).
5. Repeat Step 4 for each connector.

   The connector cables are labeled **SYSTEM**, **ION SOURCE**, and **PRE-AMP**.
6. If the connector cables are not labeled, label them now.

CAUTION *Be sure to grasp the plug and not just the cable. Pulling on the cable to remove the connector could damage the cable.*

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Figure 5-2 Ground Cable and Screw for Removing Connectors

7. Disconnect the ground cable (Figure 5-2) from the spectrometer tube by removing the screw using a slotted screwdriver.
8. Taking care not to damage the turbo pump controller PCB located underneath the shelf, remove the wing nut, locking washer and flat washer located underneath the shelf below the spectrometer tube (Figure 5-3).

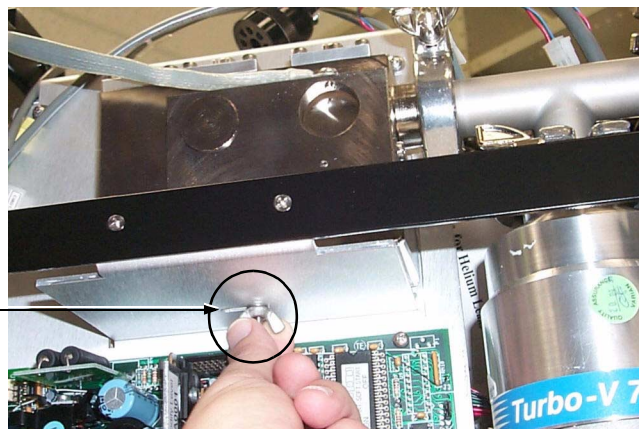

Figure 5-3 Wing Nut Under Shelf

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9. Remove the NW-25 quick clamp to disconnect the spectrometer tube from the turbo-to-spec tube manifold (Figure 5-4).

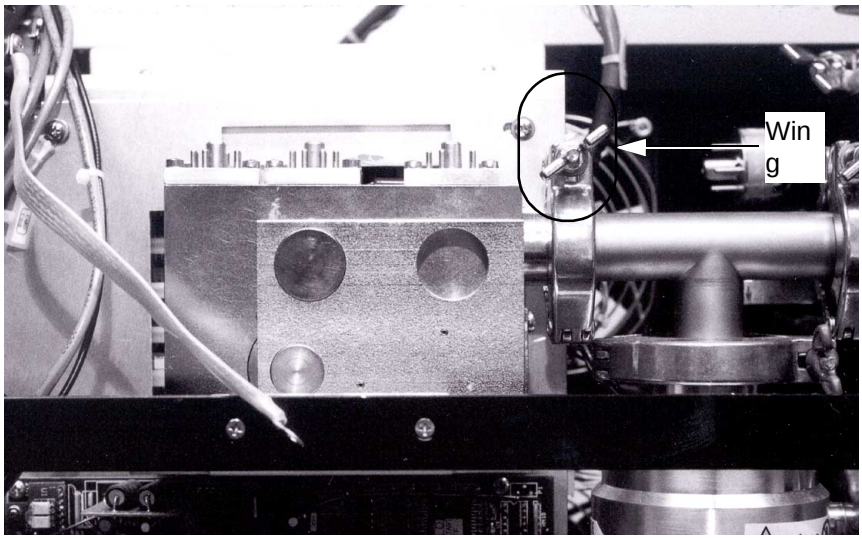

Figure 5-4 NW-25 Quick Clamp on Turbo-to-Spec Tube Manifold

10. Lift the spectrometer tube assembly off of the shelf and lay it down on a clean non-magnetic surface.

CAUTION *If the spectrometer tube magnet comes in contact with a magnetic surface, the magnet may lose its gauss causing the spectrometer tube to lose sensitivity.*

11. Using a 5-64 Allen wrench, remove the 8-32 threaded stud with Teflon standoff from the spectrometer tube and place it on a clean surface.
12. Remove the centering ring and O-ring from the spectrometer tube flange end.

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5.1.2 Examining and Cleaning the Centering Ring and O-Ring

To examine and clean the centering ring and O-ring:

1. Examine the centering ring, wipe it clean using a VacuSolv wipe, and let it air dry.
2. Carefully inspect the O-ring (Figure 5-5), and if damaged, replace it.

NOTE

When possible, replace all O-rings during routine maintenance or during maintenance procedures that require the removal of O-rings.

CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task. This prevents scratching of any sealing surfaces.

Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.

Do not use grease or other substance on O-rings that will come in contact with the spectrometer tube.

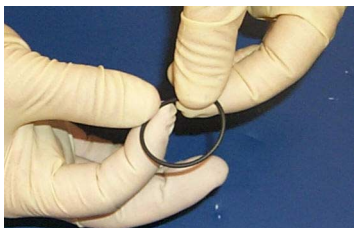

Figure 5-5 O-ring Inspection

3. Before reusing O-rings or installing new O-rings, wipe them down with a lint-free cloth to ensure that no foreign matter is present to impair the seal.
4. Place the O-ring on the centering ring.

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5.2 Reinstalling the Spectrometer Tube

To reinstall the spectrometer tube:

1. Place the 8-32 threaded stud with Teflon standoff into the bottom of the spectrometer tube and tighten it using a 5-64 Allen wrench.
2. Place the spectrometer tube assembly onto the shelf with the flange end facing the manifold elbow and the threaded stud inserted into the hole in the shelf.
3. Insert the centering ring and O-ring onto the spectrometer tube.
4. Attach the spectrometer tube to the turbo-to-spec tube manifold, replace the NW-25 quick clamp, and tighten the wing nut fully.
5. Place the washer, lock washer, and wing nut onto the threaded stud and tighten it fully.
6. Place the ground cable onto the spectrometer tube and fasten it with the slotted screw.
7. Replace the connectors, being sure to replace each one onto its proper item.

   If they are labeled, place the connector labeled:

   - ❑ **SYSTEM** on the Button TC
   - ❑ **ION SOURCE** onto the ion source
   - ❑ **PRE-AMP** onto the preamplifier

   The connectors and the center posts are keyed to go on only one way.
8. Close the vacuum by tightening the knurled nut on the turbo pump.
9. Close the front panel as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
10. Connect the pump power plugs to the rear panel if they are not connected already.
11. Connect mains power.
12. Turn the leak detector on and wait for the system to be ready.
13. Allow the pumps to warm up if the detector has been off for some time.
14. Perform the system pressure gauge calibration described in Section 9.3.1 “System Pressure Gauge Calibration Procedure” on page 9-7.
15. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
16. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

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5.3 Removing the Button Thermocouple from the Spectrometer Tube

It is not necessary to remove the front panel completely or disconnect the spectrometer tube to remove the Button Thermocouple (Button TC).

CAUTION *Do not place tension on the front panel display PCB harness.*

CAUTION *Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.*

To perform this procedure:

1. Disconnect the mains power supply and make sure all pumps are off.

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

2. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1.
3. Vent the spectrometer tube (Figure 5-6) by turning the knurled nut on the turbo pump (knurled nut not shown in this view) approximately 1/4 turn counterclockwise.

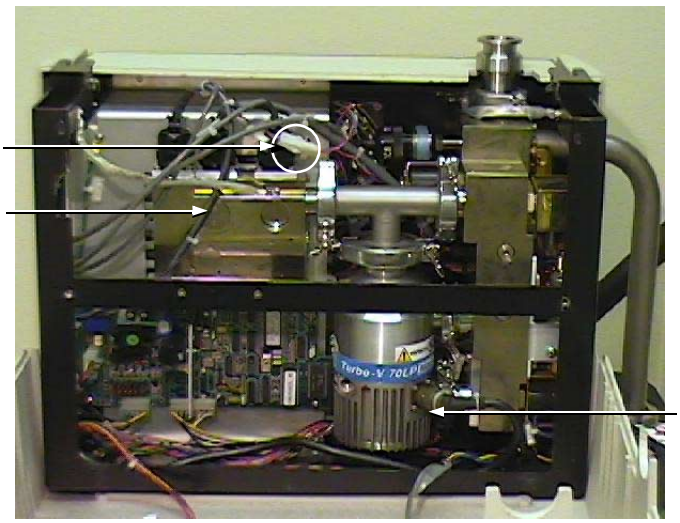

Figure 5-6 Button TC, Spectrometer Tube, and Turbo Pump

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4. Remove the connector labeled **SYSTEM** from the top of the Button TC (Figure 5-7) by grasping the plug of the connector and gently pulling it straight up and off of the contact pins.

   If the cable is not labeled, label it now.

Figure 5-7 Connector Removal

CAUTION *Be sure to grasp the plug and not just the cable. Pulling on the cable to remove the connector could damage the cable.*

5. Remove the 4 Phillips screws that hold the Button TC flange cap (Figure 5-8).

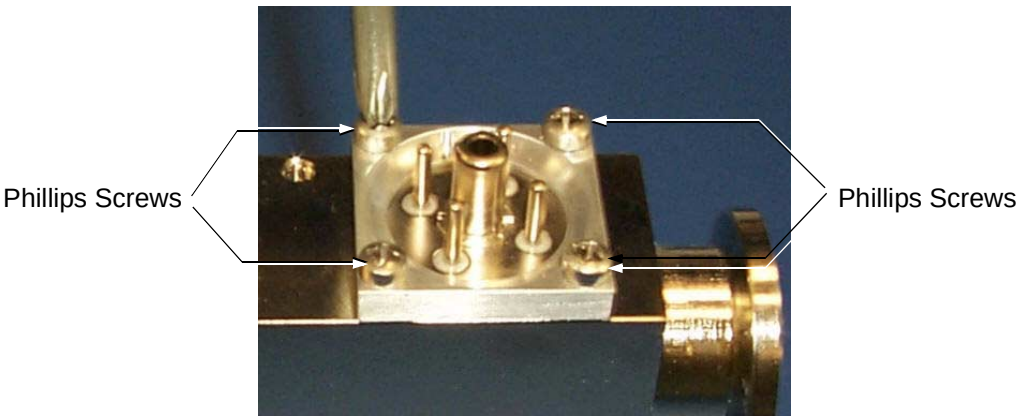

Figure 5-8 Phillips Screws on Button TC Assembly

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6. Remove the Button TC flange cap (Figure 5-9) by pressing down on the Button TC center post and lifting the flange cap up and off of the Button TC.

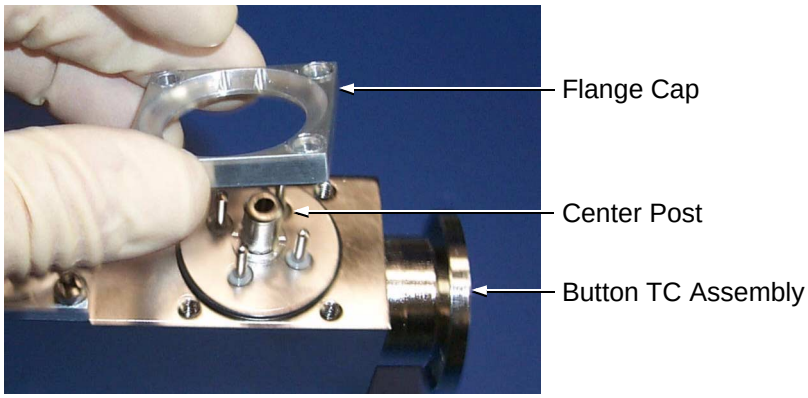

Figure 5-9 Flange Cap and Center Post on Button TC Assembly

7. If the flange cap and Button TC come up together, hold one hand under the Button TC to catch it, and push down on the center post to remove the flange cap from the Button TC.
8. Examine the Button TC and the Button TC chamber. If either is discolored or dirty, contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

NOTE

If Customer Service recommends a complete spectrometer tube overhaul, follow the procedure in Section 5.9 "Spectrometer Tube Overhaul" on page 5-20.

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5.4 Replacing the Button Thermocouple

CAUTION

Handle the Button TC carefully (Figure 5-10). The sensing wire on the bottom side of the TC is approximately 3 mils thick. Care must be taken not to damage this wire.

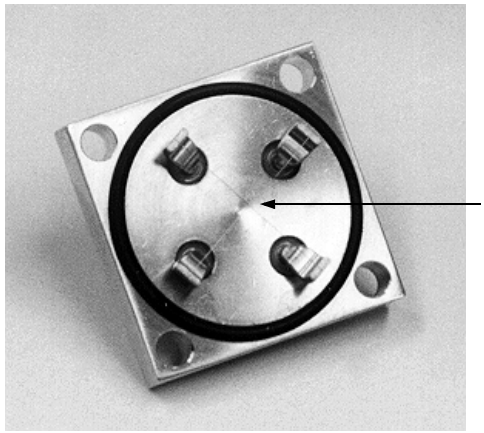

Figure 5-10 Sensing Wire

NOTE

When replacing the preamplifier, ion source, and Button TC, position the key of the center post to be perpendicular to the spectrometer tube body facing the rear. Replace the flange cap so that the groove is aligned with the two legs on either side of the key.

To replace the Button TC:

1. Hold the Button TC by the contact pins and insert it carefully into the Button TC cavity in the spectrometer tube body.

   Position the key in the center post to be perpendicular to the spectrometer tube body and facing the rear.

2. Examine the flange cap to be sure it is not damaged.
3. Wipe the flange cap with a lint free cloth to be sure it is free of debris.

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4. Replace the Button TC flange cap so that the grooves (Figure 5-11) in the depression of the flange cap line up with the center post key.
5. Insert and tighten the 4 Phillips screws.

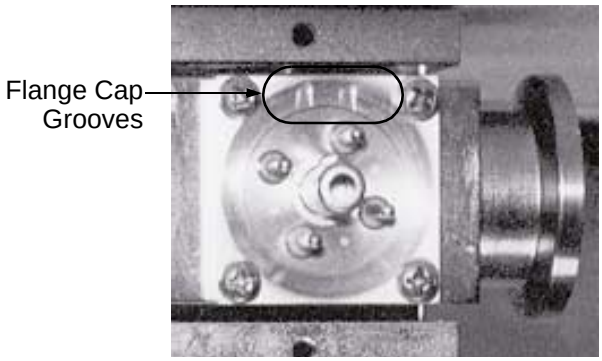

Figure 5-11 Flange Cap Grooves

6. Place the connector labeled **SYSTEM** firmly onto the Button TC.

   The connector and center post are keyed to go on only one way.
7. Close the vacuum by tightening the knurled nut on the turbo pump.
8. Close the front panel as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
9. Connect the pump power plugs to the rear panel if they are not connected already.
10. Connect mains power.
11. Turn the leak detector on and wait for the system to be ready.
12. Allow the pumps to warm up if the detector has been off for some time.
13. Perform the system pressure gauge calibration described in Section 9.3.1 “System Pressure Gauge Calibration Procedure” on page 9-7.
14. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
15. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

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5.5 Removing the Ion Source

To remove the Ion Source it is not necessary to remove the front panel completely or disconnect the spectrometer tube. However, take care not to place tension on the front panel display PCB harness.

CAUTION *Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.*

To remove the ion source:

1. Disconnect the mains power supply and make sure all pumps are off.

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

2. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1.
3. Vent the spectrometer tube (Figure 5-12) by turning the knurled nut on the turbo pump (knurled nut not shown in this view) approximately 1/4 turn counterclockwise.

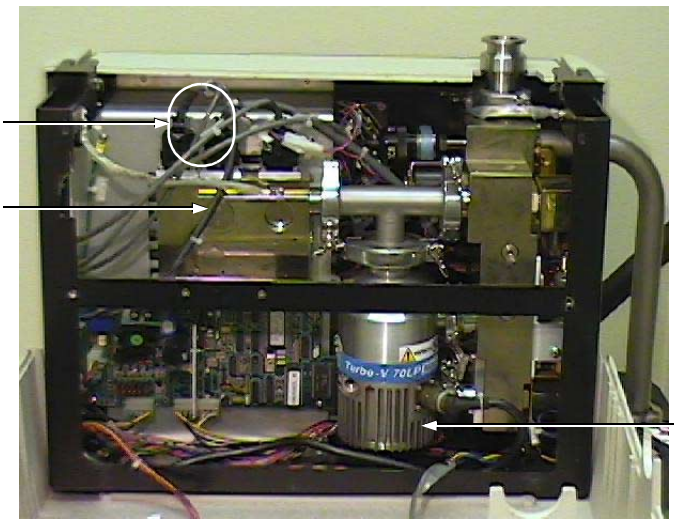

Figure 5-12 Ion Source, Spectrometer Tube, and Turbo Pump

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4. Remove the connector labeled **ION SOURCE** from the top of the Ion Source by grasping the plug of the connector and gently pulling it straight up and off of the contact pins.

   If the cable is not labeled, label it now.

CAUTION *Be sure to grasp the plug and not just the cable. Pulling on the cable to remove the connector could damage the cable.*

5. Remove the 4 Phillips screws that hold the ion source flange cap.

WARNING *When handling the Ion Source, wear powder-free butyl or polycarbonate gloves. If you handle the Ion Source with bare hands, wash them thoroughly, especially before smoking or eating.*

6. Remove the ion source flange cap by pressing down on the ion source center post and lifting the flange cap up and off of the ion source.
7. If the flange cap and ion source come up together, hold one hand under the ion source to catch it and push down on the center post to remove the flange cap from the ion source.
8. Remove the ion source from the spectrometer tube body (Figure 5-13).

Figure 5-13 Ion Source Removal

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9. Examine the ion source (Figure 5-14) and cavity (Figure 5-15) for deposits and discoloration.
10. If either is discolored or dirty contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

NOTE

Dark carbon-like deposits around the ion source filament and/ or a rainbow-like discoloration on the inside walls of the ion source cavity indicate that the spectrometer tube has been operated at too high a pressure. This can occur from a system pressure leak or transferring into test at too high a pressure.

If Customer Service recommends a complete spectrometer tube overhaul, follow the procedure in Section 5.9 “Spectrometer Tube Overhaul” on page 5-20.

11. When examination is complete, dispose of the ion source properly or return it to Varian Vacuum Technologies for exchange.

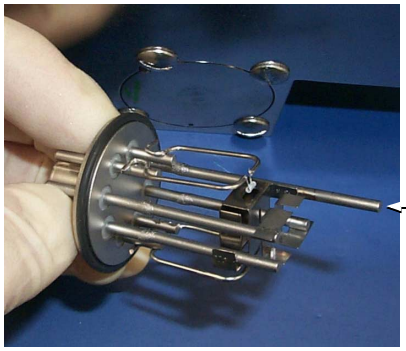

Figure 5-14 Alignment Pin

12. Locate the ground slit plate in the ion source cavity (Figure 5-15).
13. If this is highly discolored, contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

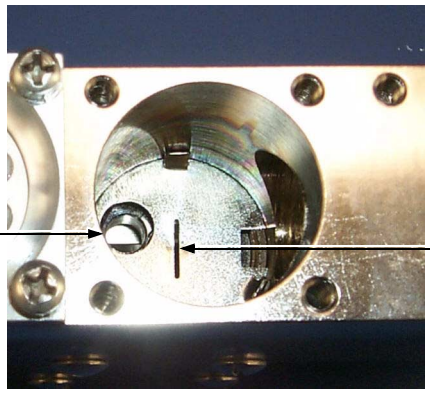

Figure 5-15 Alignment Hold and Ground Slit Plate in Ion Source Cavity

If Customer Service recommends a complete spectrometer tube overhaul, follow the procedure in Section 5.9 “Spectrometer Tube Overhaul” on page 5-20.

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5.6 Replacing the Ion Source

NOTE

It is good practice when replacing the preamplifier, ion source and Button TC to have the key of the center post line up perpendicular to the spectrometer tube body and face the back. This alignment happens by default for some of these pieces. It is also good practice to replace the flange cap with the groove aligned with the two legs on either side of the key.

To replace the Ion Source:

CAUTION

A short could result at power up if the alignment pin touches the sides of the alignment hole.

1. Holding the ion source by the connector pins, insert the ion source into the cavity so that its alignment pin falls in the center of the hole in the cavity (Figure 5-16).

CAUTION

Be careful not to let the ion source alignment pin touch the sides of the hole.

NOTE

If necessary, hold onto the O-ring (Figure 5-16) so that it seats properly when you insert the ion source.

Figure 5-16 Ion Source Insertion

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2. Replace the ion source flange cap so that the grooves in the depression of the flange cap (Figure 5-17) line up with the legs on either side of the center post.
3. Insert and tighten the 4 Phillips screws.

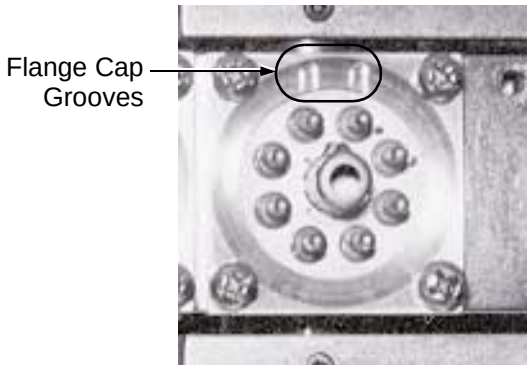

Figure 5-17 Alignment of Flange Cap Grooves with Ion Source Center Legs

4. Place the connector labeled **ION SOURCE** firmly onto the Ion Source.

   The connector and center post are keyed to fit only one way.
5. Close the vacuum by tightening the knurled nut on the turbo pump.
6. Close the front panel as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
7. Connect the pump power plugs to the rear panel if they are not connected already.
8. Connect mains power.
9. Turn the leak detector on and wait for the system to be ready.
10. Allow the pumps to warm up if the detector has been off for some time.
11. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
12. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability” for guidelines.

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5.7 Removing the Preamplifier

CAUTION *The preamplifier is a static sensitive device. Wear a grounding device while the preamplifier is being handled.*

To remove the preamplifier it is not necessary to remove the front panel completely or disconnect the spectrometer tube. However, take care not to place tension on the front panel display PCB harness.

CAUTION *Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.*

To remove the preamplifier:

1. Disconnect the mains power supply and make sure all pumps are off.

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

2. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1.
3. Vent the spectrometer tube (Figure 5-18) by turning the knurled nut on the turbo pump (knurled nut not shown in this view) approximately 1/4 turn counterclockwise.

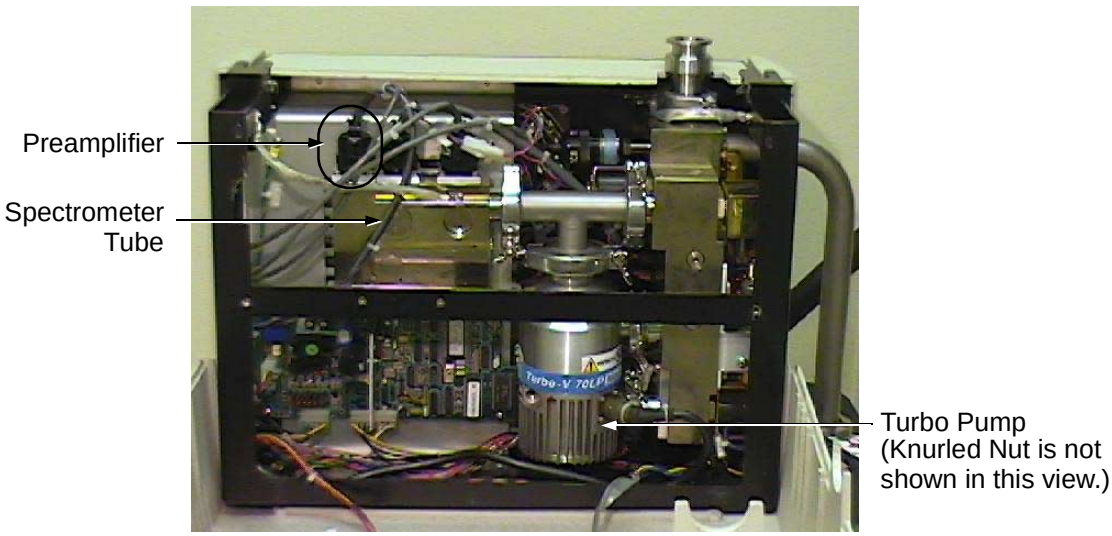

Figure 5-18 Spectrometer Tube and Turbo Pump

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4. Remove the connector labeled **PRE-AMP** from the top of the preamplifier by grasping the plug of the connector and gently pulling it straight up and off of the contact pins.
5. If the cable is not labeled, label it now.

CAUTION *Be sure to grasp the plug and not just the cable. Pulling on the cable to remove the connector could damage the cable.*

6. Remove the 4 Phillips screws that hold the preamplifier flange cap.
7. Remove the preamplifier flange cap by pressing down on the preamplifier center post and lifting the flange cap up and off of the preamplifier.
8. If the flange cap and preamplifier come up together, hold one hand under the preamplifier to catch it, and push down on the center post to remove the flange cap from the preamplifier.
9. Carefully remove the preamplifier from the spectrometer tube body (Figure 5-19) and place it carefully on a clean surface.

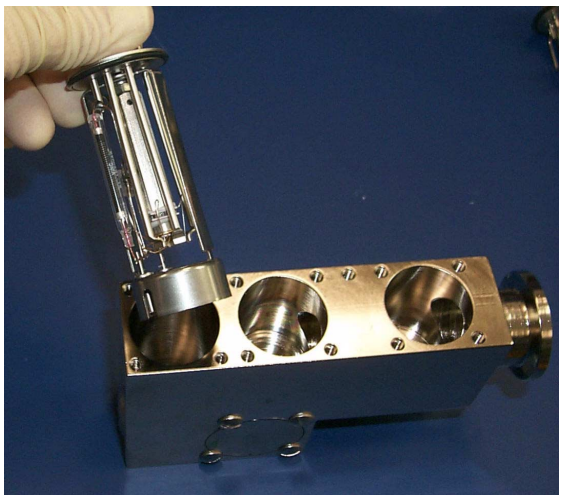

Figure 5-19 Preamplifier Removal

10. Examine the preamplifier and the preamplifier chamber.
11. If either is discolored or dirty contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

    If Customer Service recommends a complete spectrometer tube overhaul, follow the procedure in Section 5.9 “Spectrometer Tube Overhaul” on page 5-20.

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5.8 Replacing the Preamplifier

To replace the preamplifier:

NOTE

It is good practice when replacing the preamplifier, ion source and Button TC to have the key of the center post line up perpendicular to the spectrometer tube body and face the back. This alignment happens by default for some of these pieces. It is also good practice to replace the flange cap with the groove aligned with the two legs on either side of the key.

1. Hold the preamplifier by the contact pins and place it into the preamplifier cavity of the spectrometer tube body aligning the slot with the alignment pin in the preamplifier cavity (Figure 5-20).

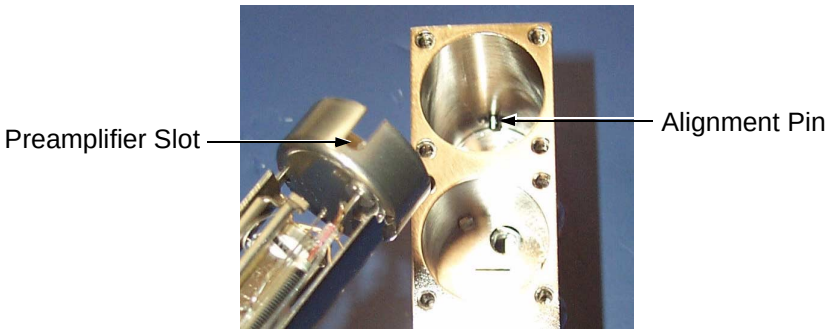

Figure 5-20 Preamplifier Slot and Alignment Pin

2. Replace the preamplifier flange cap so that the grooves in the depression of the flange cap line up with the legs on either side of the center post (Figure 5-21).
3. Insert and tighten the 4 Phillips screws.

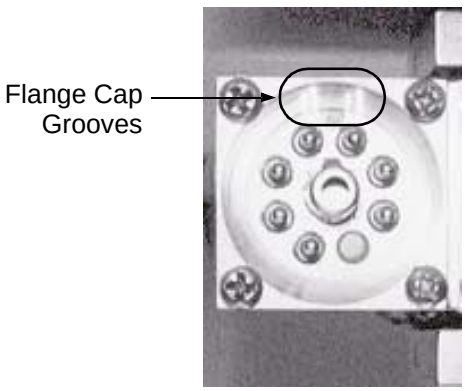

Figure 5-21 Alignment of Flange Cap Grooves with Preamplifier Legs

4. Place the connector labeled **PRE-AMP** firmly onto the preamplifier.

   The connector and center post are keyed to fit only one way.
5. Close the vacuum by tightening the knurled nut on the turbo pump.

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6. Close the front panel as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
7. Connect the pump power plugs to the rear panel if they are not connected already.
8. Connect mains power.
9. Turn the leak detector on and wait for the system to be ready.
10. Allow the pumps to warm up if the detector has been off for some time.
11. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
12. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

5.9 Spectrometer Tube Overhaul

Removing, cleaning, reassembling and re-installing are the four basic procedures that make up spectrometer tube overhaul. These procedures, if done annually (for a leak detector in daily use), will prevent deterioration and maintain a high level of performance. For heavy production use, more frequent overhauls may be needed. In most cases, this work can be performed by user maintenance personnel, but it can also be done by Varian Vacuum Technologies under the terms of a service contract.

There are four basic sub-assemblies in the 979 Spectrometer tube. Removal instructions follow this order:

- ❑ Button Thermocouple (TC)
- ❑ Ion Source
- ❑ Preamplifier
- ❑ Magnet Assembly

CAUTION

Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.

The preamplifier is a static sensitive device. Wear a grounding device while the preamplifier is being handled.

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5.9.1 Removing the Spectrometer Tube Assembly as Part of Overhaul

NOTE

Rebuilt spectrometer tubes are available from Varian Vacuum Technologies on an exchange basis. Contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN for details.

To perform this procedure:

1. Disconnect the mains power supply and make sure all pumps are off.

WARNING

Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.

The spectrometer tube operates at a very high vacuum produced by the high vacuum pump. Service of the spectrometer tube requires that this vacuum be vented to the atmosphere.

2. Open the front panel as described in Section 3.1 “Opening the Front Panel”.

   It is not necessary to remove the front panel completely, to remove the spectrometer tube, however, take care not to place tension on the front panel display PCB harness.

3. Vent the spectrometer tube (Figure 5-22) by turning the knurled nut on the turbo pump (knurled nut not shown in this view) approximately 1/4 turn counterclockwise.

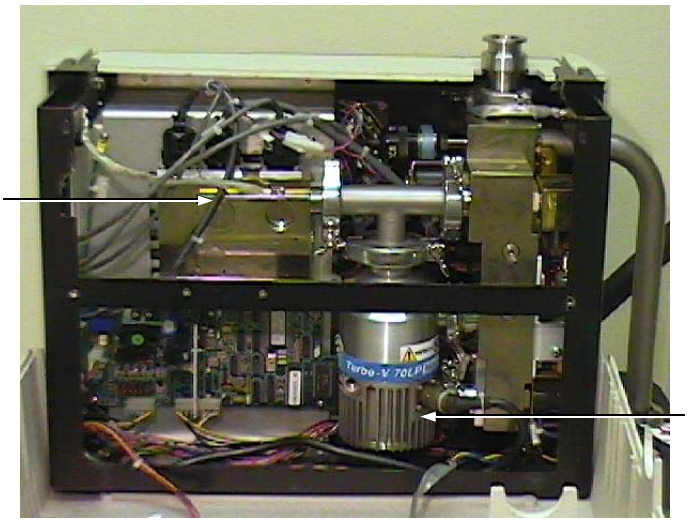

Figure 5-22 Spectrometer Tube and Turbo Pump

In addition to the three connectors on the top of the unit (Figure 5-22), and the ground cable, the spectrometer tube is attached using a NW-25 quick clamp and a wing nut located below the tube (not shown in this view).

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4. Remove the three connectors (Figure 5-22 on page 5-21) from the top of the spectrometer tube by grasping the plug of each connector and gently pulling it straight up and off of the contact pins (Figure 5-23).

   The connector cables are labeled **SYSTEM**, **ION SOURCE**, and **PRE-AMP**. If the cables are not labeled, label them now.

CAUTION *Be sure to grasp the plug and not just the cable. Pulling on the cable to remove the connector could cause damage to the cable.*

Figure 5-23 Ground Cable and Screw

5. Disconnect the ground cable (Figure 5-23) from the spectrometer tube by removing the screw with a slotted screwdriver.
6. Taking care not to damage the turbo pump controller PCB located underneath the shelf, remove the wing nut, locking washer, and flat washer located underneath the shelf and below the spectrometer tube (Figure 5-24).

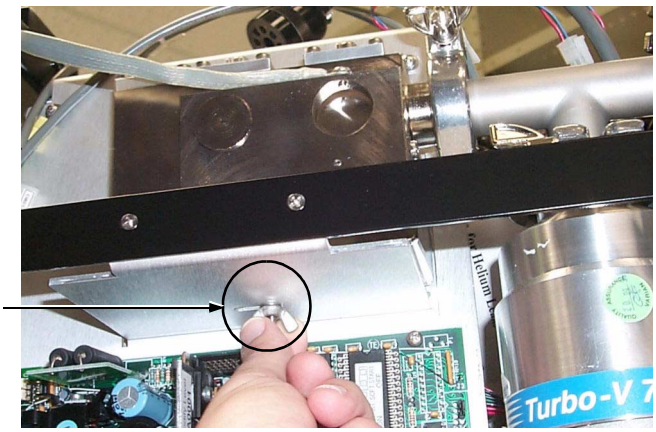

Figure 5-24 Wing Nut under Shelf

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7. Remove the NW-25 quick clamp to disconnect the spectrometer tube from the turbo-to-spec tube manifold (Figure 5-25).

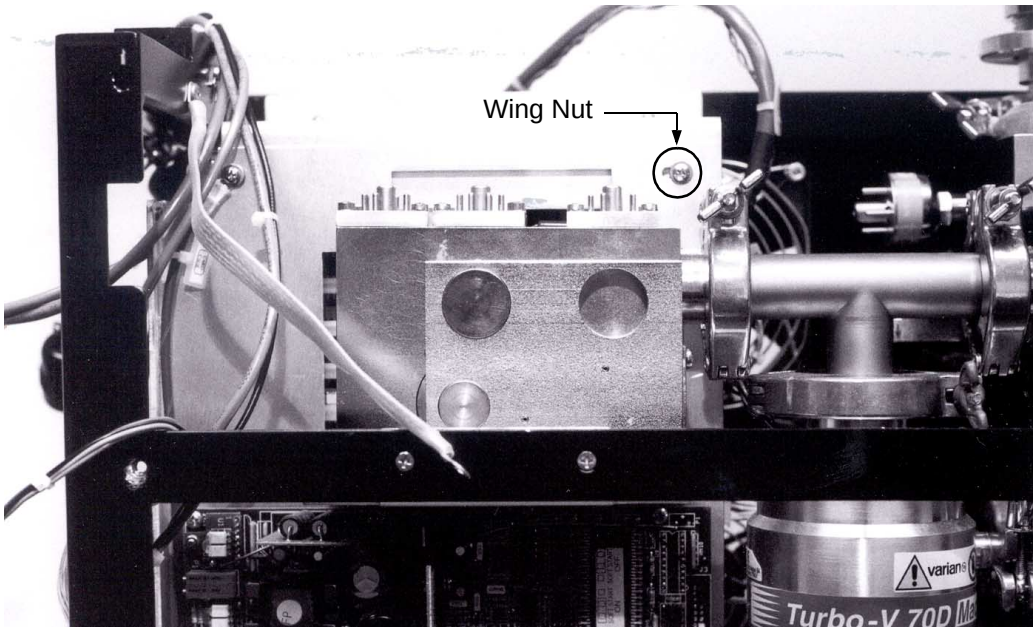

Figure 5-25 NW-25 Quick Clamp on Turbo-to-Spec Tube Manifold

8. Lift the spectrometer tube assembly up and off of the shelf and lay it down on a clean non-magnetic surface.

CAUTION

If the spectrometer tube magnet comes in contact with a magnetic surface, the magnet may lose its gauss causing the spectrometer tube to lose sensitivity.

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9. Remove the centering ring and O-ring from the spectrometer tube.

CAUTION *Do not remove the 6 magnet body bracket screws shown in Figure 5-26.*

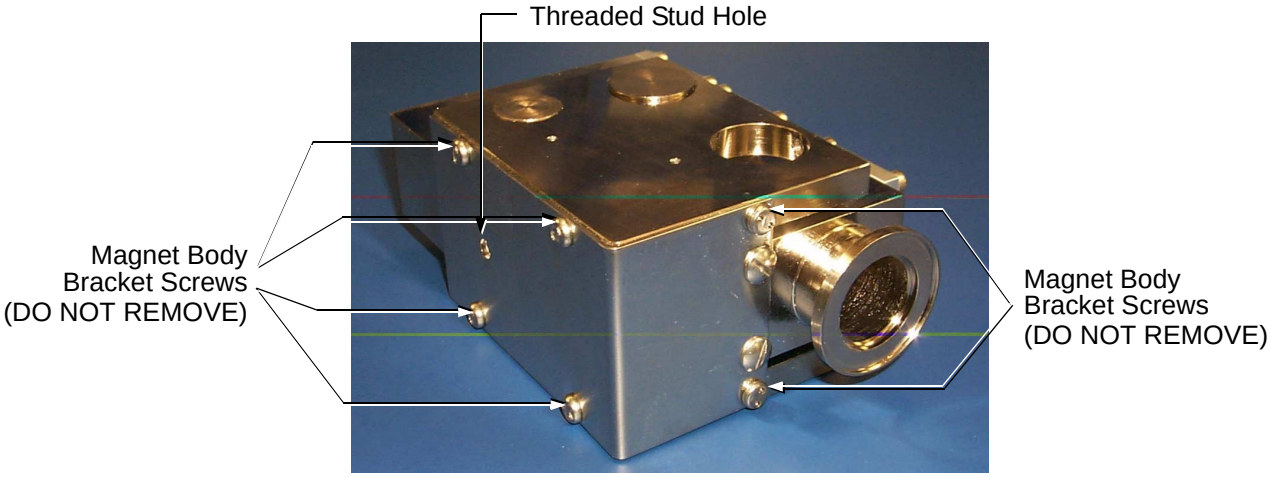

Figure 5-26 Magnet Body Bracket Screws

10. Using a 5-64 Allen wrench, remove the 8-32 threaded stud and Teflon standoff from the bottom of the spectrometer tube.

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5.9.2 Removing the Magnet Assembly from Spectrometer Tube as Part of Overhaul

To remove the magnet assembly from spectrometer tube:

1. Remove the 2 slotted screws that mount the spectrometer tube magnet assembly to the spectrometer tube body (Figure 5-27).

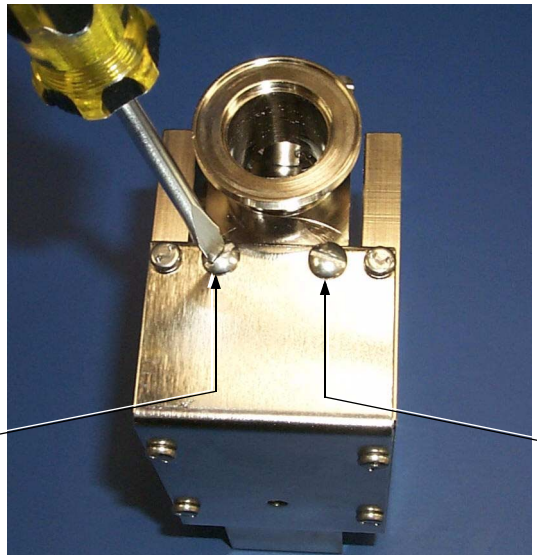

Figure 5-27 Spectrometer Tube Magnet Assembly Slotted Screws

2. Carefully slide the magnet assembly off of the spectrometer tube body (Figure 5-28).

   If the magnet assembly does not slide off easily, it may be necessary to loosen the GA pole pieces using a 5-64 Allen wrench by backing out the 8-32 set screws located on both sides of the assembly (Figure 5-28). Do not remove the set screws and GA pole pieces completely.

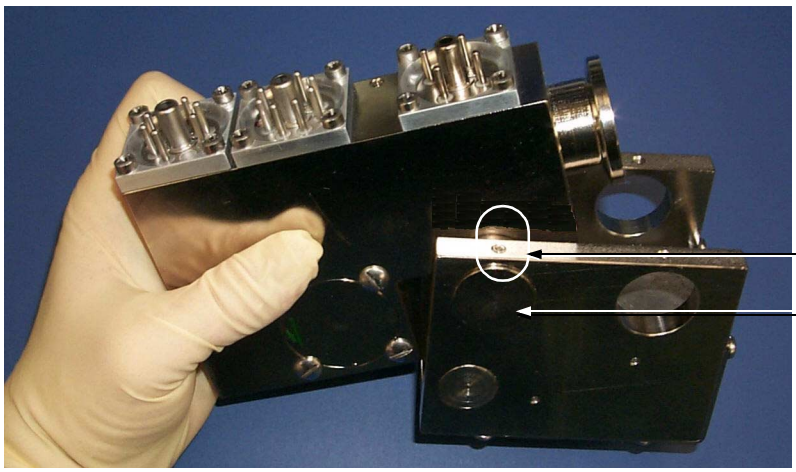

Figure 5-28 Sliding the Magnet Assembly off the Spectrometer Tube

3. Place the magnetic assembly on a clean, non-magnetic surface.

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5.9.3 Removing the Button Thermocouple as part of Spectrometer Tube Overhaul

To remove the button thermocouple:

1. Remove the 4 Phillips screws that hold the Button TC flange cap (Figure 5-29).

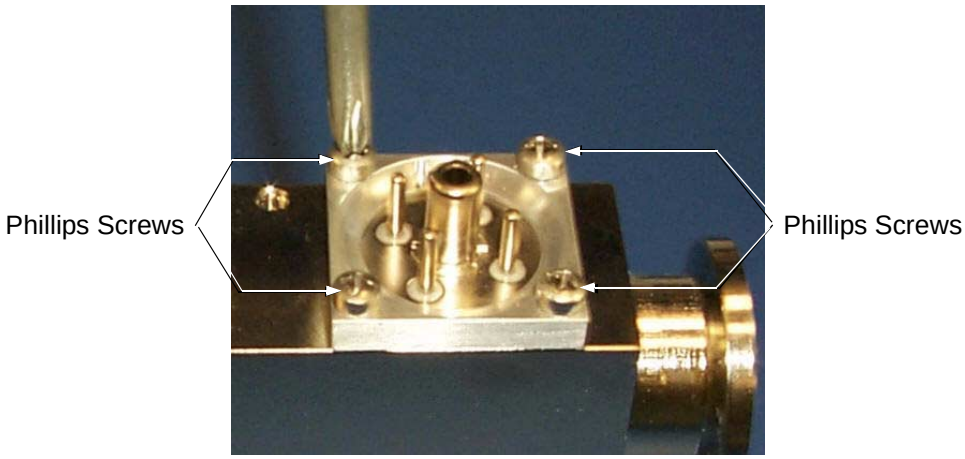

Figure 5-29 Phillips Screws on Button TC Assembly

2. Remove the Button TC flange cap (Figure 5-30) by pressing down on the Button TC center post and lifting the flange cap up and off of the Button TC.

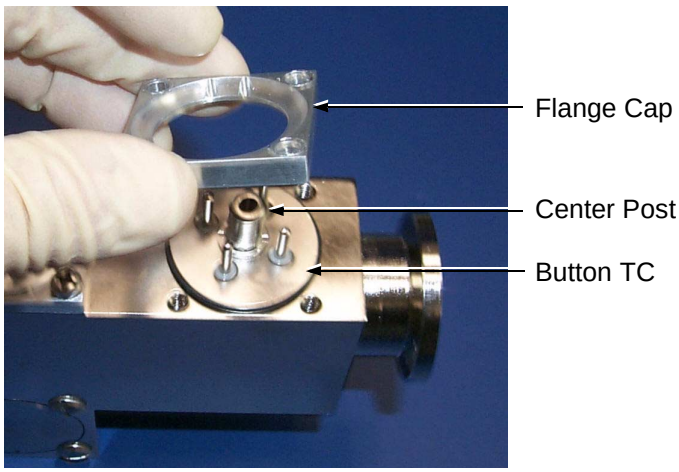

Figure 5-30 Flange Cap, Center Post, and Button TC

CAUTION

The sensing wire on the bottom side of the Button TC is approximately 3 mils thick. Care must be taken not to damage this wire.

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3. If the flange cap and Button TC come up together, hold one hand under the Button TC to catch it, and push down on the center post to remove the flange cap from the Button TC.

   Be careful not to damage the sensing wire.

4. Remove the Button TC carefully and place it sensing wire side up as shown in Figure 5-31, (contact pin side down) on a clean surface.

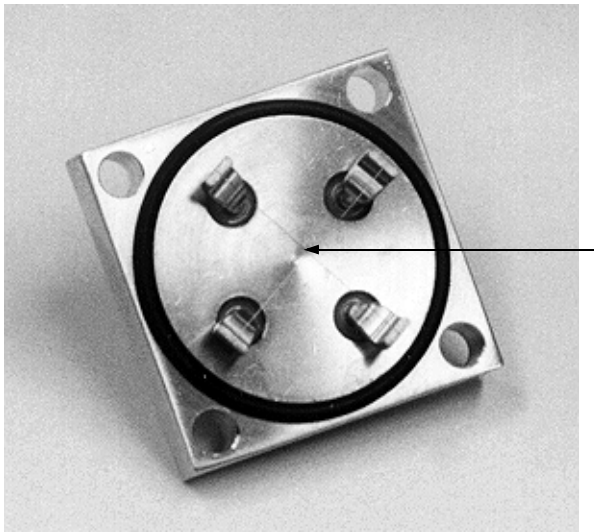

Figure 5-31 Button TC with Flange Cap and Sensing Wire

5. Carefully remove the O-ring.

5.9.4 Removing the Ion Source as part of Spectrometer Tube Overhaul

To remove the ion source:

1. Remove the 4 Phillips screws that hold the ion source flange cap.

WARNING *When handling the Ion Source, wear powder-free butyl or polycarbonate gloves. If you handle the Ion Source with bare hands, wash them thoroughly, especially before smoking or eating.*

2. Remove the ion source flange cap by pressing down on the ion source center post and lifting the flange cap up and off of the ion source.
3. If the flange cap and ion source come up together, hold one hand under the ion source to catch it and push down on the center post to remove the flange cap from the ion source.

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4. Remove the ion source from the spectrometer tube body (Figure 5-32).

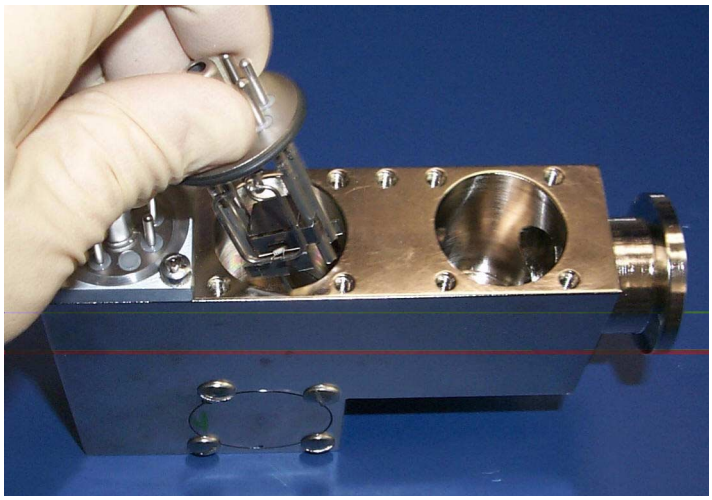

Figure 5-32 Removal of Ion Source from Spectrometer Tube

5. Examine the ion source (Figure 5-33) and cavity (Figure 5-34) for deposits and discoloration.

NOTE

Dark carbon-like deposits around the ion source filament and/ or a rainbow-like discoloration on the inside walls of the ion source cavity indicate that the spectrometer tube has been operated at too high a pressure. This can occur from a system pressure leak or transferring into test at too high a pressure.

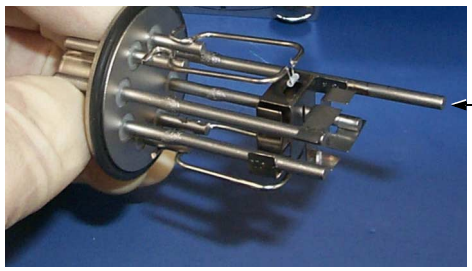

Figure 5-33 Ion Source and Alignment Pin

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6. Remove the O-ring from the Ion Source.
7. Locate the ground slit plate inside the ion source cavity (Figure 5-34).

   If this is highly discolored, contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

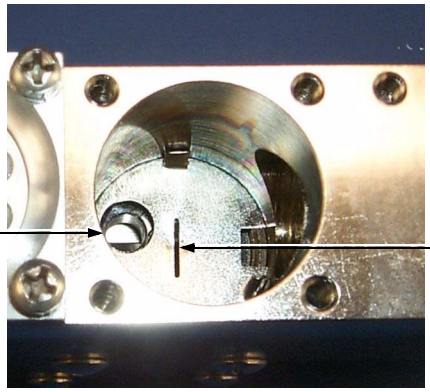

Figure 5-34 Ion Source Cavity

CAUTION

The ground slit plate is very thin. Take care not to bend or disfigure it during cleaning. A locking screwdriver designed to grab onto the slot of a screw works very well for this procedure.

8. Use a thin, slotted screwdriver to free the ground slit plate free from the ion source cavity (Figure 5-35) and place it on a clean surface.

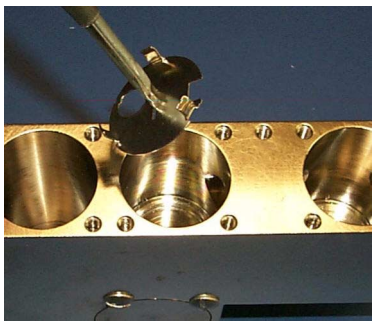

Figure 5-35 Ground Slit Plate

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5.9.5 Removing the Preamplifier as Part of Spectrometer Tube Overhaul

CAUTION *The preamplifier is a static sensitive device. Wear a grounding device while the preamplifier is being handled.*

To remove the preamplifier:

1. Remove the 4 Phillips screws that hold the preamplifier flange cap.
2. Remove the preamplifier flange cap by pressing down on the preamplifier center post and lifting the flange cap up and off of the preamplifier.
3. If the flange cap and preamplifier come up together, hold one hand under the preamplifier to catch it, and push down on the center post to remove the flange cap.
4. Carefully remove the preamplifier from the spectrometer tube body (Figure 5-36) and place it carefully on a clean surface.

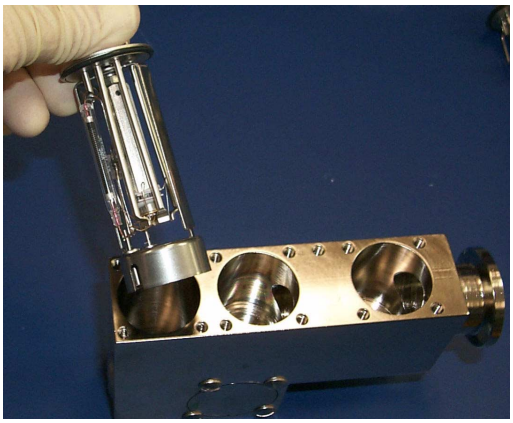

Figure 5-36 Removal of Preamplifier

5. Remove the O-ring from the preamplifier.

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5.9.6 Removing the Deflecting Magnetic Pole Pieces as Part of Spectrometer Tube Overhaul

To remove the deflecting magnetic pole pieces:

1. Remove the 4 slotted screws to free the deflecting magnetic pole piece (Figure 5-37).

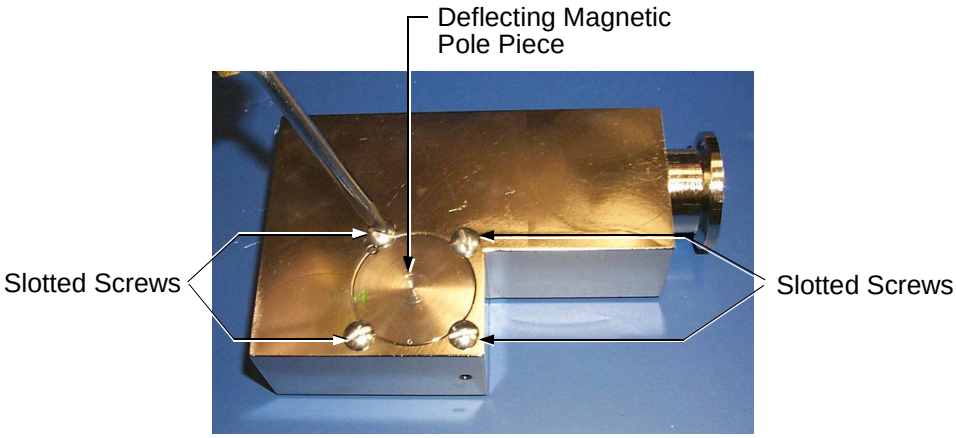

Figure 5-37 Deflecting Magnetic Pole Piece Slotted Screws

2. Lift the spectrometer tube body and tilt the side over to remove the deflecting magnetic pole piece.
3. Remove the O-ring from the deflecting magnetic pole piece and place both the O-ring and the deflecting magnetic pole piece on a clean surface (Figure 5-38).

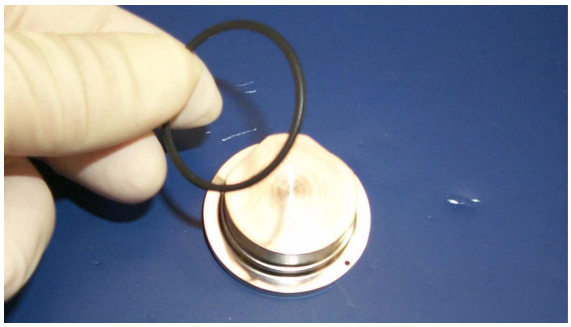

Figure 5-38 O-ring Removal from Deflecting Magnetic Pole Piece

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4. Repeat Step 1and Step 2 to remove the second deflecting magnetic pole piece (Figure 5-39) from the other side of the spectrometer tube body.

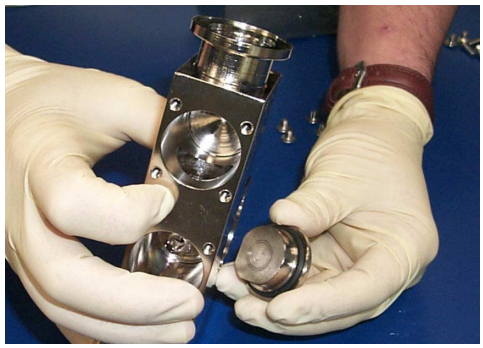

Figure 5-39 Removal of Second Deflecting Magnetic Pole Piece

5. Remove the O-ring from the deflecting magnetic pole piece as in Step 3 and place both on a clean surface.

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5.9.7 Examining and Cleaning the Spectrometer Parts

To examine and clean the spectrometer parts:

1. Using the Scotch-Brite™ pad included with the spectrometer tube cleaning kit, polish away any discolored areas inside the spectrometer tube cavity.

CAUTION *The ground slit plate is very thin. Take care not to bend or disfigure it during cleaning.*

2. Using the Scotch-Brite pad, polish away any discolored areas of the ground slit plate (Figure 5-40).

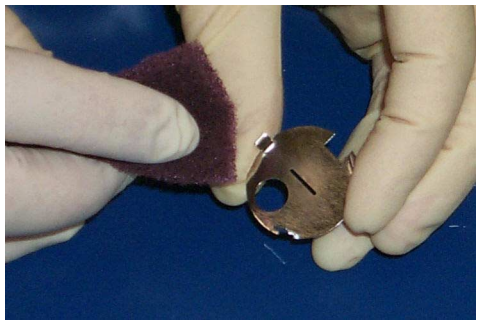

Figure 5-40 Discolored Ground Slit Plate

3. Using the Scotch-Brite pad, polish away any discolored areas of the deflecting magnetic pole pieces (Figure 5-41).

Figure 5-41 Discolored Deflecting Magnetic Pole Piece

4. Using the VacuSolv presaturated cleaning wipes and swabs (Figure 5-42), thoroughly wipe down all surfaces of the spectrometer tube body, deflecting magnetic pole pieces, magnet assembly, and ground slit plate.

Figure 5-42 VacuSolv Cleaning Wipes

CAUTION

The sensing wire on the bottom side of the Button TC is approximately 3 mils thick. Care must be taken not to damage this wire.

5. Examine the Button TC.

   If no damage is detected, clean for reuse.

NOTE

If false system pressure readings occurred prior to overhaul, replace the Button TC.

If necessary, soak the Button TC in liquid VacuSolv (or acetone) followed by an isopropyl alcohol rinse. Air dry the Button TC thoroughly before inserting it into the spectrometer tube.

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CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task. This prevents scratching of any sealing surfaces.

Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.

Do not use grease or other substance on O-rings that will come in contact with the spectrometer tube.

6. Carefully inspect all O-rings (Figure 5-43).

NOTE

Varian Vacuum Technologies recommends replacing all O-rings during routine maintenance or during any maintenance procedure requiring that O-rings be removed.

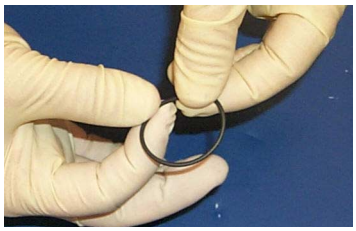

Figure 5-43 O-ring Inspection

7. Before reusing an O-ring or installing a new O-ring, wipe it with a lint-free cloth to ensure that no foreign matter is present to impair the seal.

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5.10 Reassembling the Spectrometer Tube

5.10.1 Replacing the Deflecting Magnetic Pole Pieces

To perform this procedure:

1. Place the O-ring onto the deflecting magnetic pole piece.
2. Lay the spectrometer tube body on its side and place the deflecting magnetic pole piece into the cavity.
3. Replace the 4 slotted screws and tighten.
4. Repeat Step 1 through Step 3 for the other deflecting magnetic pole piece.

5.10.2 Replacing the Preamplifier as Part of Spectrometer Tube Overhaul

CAUTION *The preamplifier is a static sensitive device. Wear a grounding device while the preamplifier is being handled.*

NOTE *It is good practice when replacing the preamplifier, ion source and Button TC to have the key of the center post line up perpendicular to the spectrometer tube body and face the back. This alignment happens by default for some of these pieces. It is also good practice to replace the flange cap with the groove aligned with the two legs on either side of the key.*

To perform this procedure:

1. Place the O-ring onto the preamplifier.
2. Hold the preamplifier by its contact pins and place it into the preamplifier cavity of the spectrometer tube body aligning the slot with the alignment pin in the preamplifier cavity (Figure 5-44).

   If necessary, hold the O-ring with one finger to keep it in place.

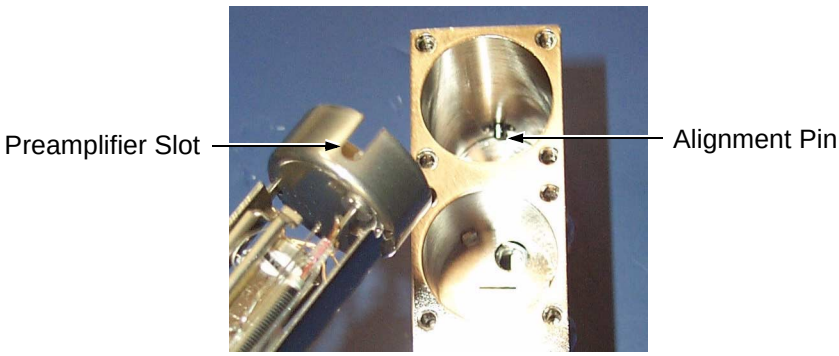

Figure 5-44 Replace the Preamplifier

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3. Replace the preamplifier flange cap so that the grooves in the depression of the flange cap line up with the legs on either side of the center post (Figure 5-45).

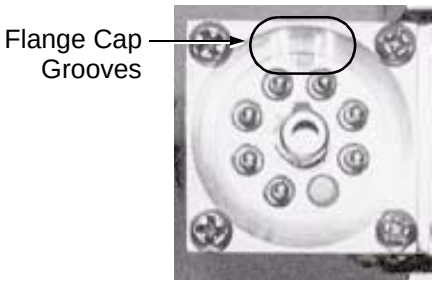

Figure 5-45 Flange Cap Grooves Aligned with Preamplifier Legs

4. Insert and tighten the 4 Phillips screws.

5.10.3 Replacing the Ion Source as Part of Spectrometer Tube Overhaul

To perform this procedure:

1. Place the ground slit plate onto the locking screwdriver as you did to remove it (Figure 5-46) with the prongs facing up.

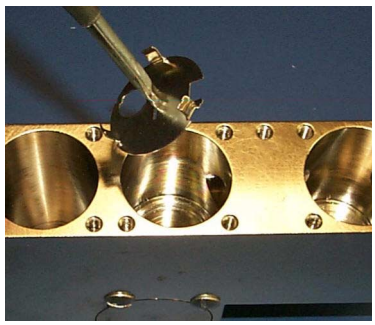

Figure 5-46 Insertion of Ground Slit Plate in Ion Source Cavity

CAUTION

The ground slit plate must be firmly seated and in proper orientation. Failure to do so can result in unreliable test results.

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2. Carefully place the ground slit plate into the cavity, being sure to align the slit so that it is perpendicular to the back and front of the spectrometer tube (Figure 5-47).

   The hole in the ground slit plate lines up with the alignment hole on the bottom of the spectrometer tube body ion source cavity.

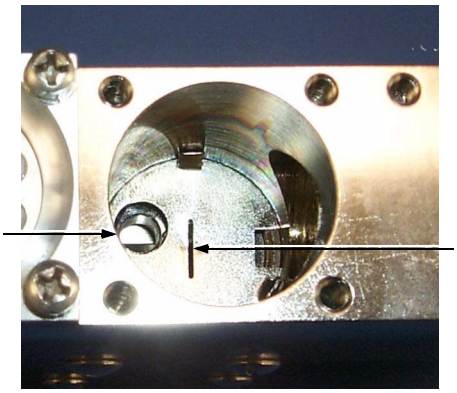

Figure 5-47 Properly Inserted Ground Slit Plate

CAUTION *If it is necessary to bend the ground slit plate prongs out, be sure to bend them only slightly so that when it is being inserted the prongs do not scratch the ion source cavity.*

3. Check that the ground slit plate is firmly seated in the ion source cavity.

   If it is not, remove it and, using a screwdriver, bend the prongs out *slightly* and place the ground slit plate into the cavity again.

WARNING *When handling the Ion Source, wear powder-free butyl or polycarbonate gloves. If you handle the Ion Source with bare hands, wash them thoroughly, especially before smoking or eating.*

4. Place the O-ring onto the ion source.

NOTE *It is good practice when replacing the preamplifier, ion source and Button TC to have the key of the center post line up perpendicular to the spectrometer tube body and face the back. This alignment will happen by default for some of these pieces. It is also good practice to replace the flange cap with the groove aligned with the two legs on either side of the key.*

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5. Hold the ion source by the connector pins, and the O-ring if necessary, and insert it into the cavity so that its alignment pin falls in the center of the hole in the cavity (Figure 5-47 on page 5-37 and Figure 5-48).

CAUTION *Do not let the ion source alignment pin touch the sides of the hole. short could result at power up.*

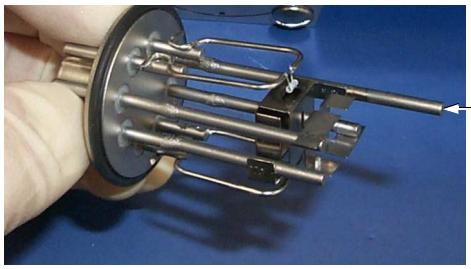

Figure 5-48 Ion Source Alignment Pin

6. Replace the ion source flange cap so that the grooves in the depression of the flange cap line up with the legs on either side of the center post (Figure 5-49).

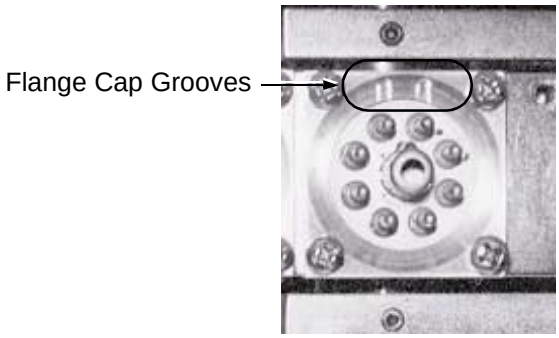

Figure 5-49 Flange Cap Grooves Aligned with Ion Source Legs

7. Insert and tighten the 4 Phillips screws.

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5.10.4 Replacing the Button Thermocouple as Part of Spectrometer Tube Overhaul

CAUTION

Handle the Button TC carefully. The sensing wire on the bottom side of the TC is approximately 3 mils thick. Care must be taken not to damage this wire.

NOTE

If you were seeing false system pressure readings prior to overhaul, it may be best to replace the Button TC whether or not you detect any physical signs of damage.

To perform this procedure:

1. Carefully place the O-ring onto the Button TC (Figure 5-50).

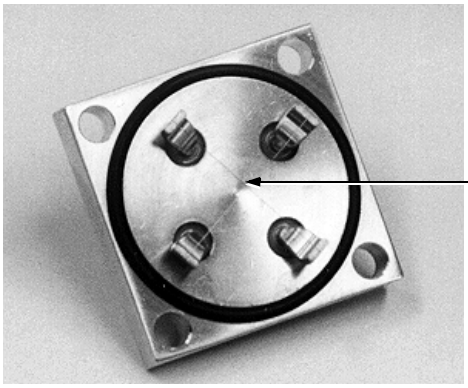

Figure 5-50 Button TC

NOTE

It is good practice when replacing the preamplifier, ion source and Button TC to have the key of the center post line up perpendicular to the spectrometer tube body and face the back. This alignment will happen by default for some of these pieces. It is also good practice to replace the flange cap with the groove aligned with the two legs on either side of the key.

2. Hold the Button TC by the contact pins and insert it carefully into the Button TC cavity in the spectrometer tube body so that the key in the center post lines up perpendicular to the spectrometer tube body and faces the back.

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3. Replace the Button TC flange cap so that the grooves in the depression of the flange cap line up with the center post key (Figure 5-51).

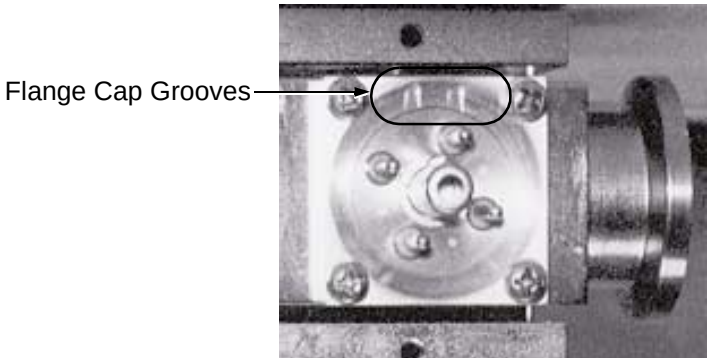

Figure 5-51 Flange Cap Grooves Aligned with Button TC Center Post Key

4. Insert and tighten the 4 Phillips screws.

5.10.5 Replacing the Magnet Assembly

CAUTION *Remember not to adjust in any way the 6 magnet body bracket screws shown in Figure 5-52.*

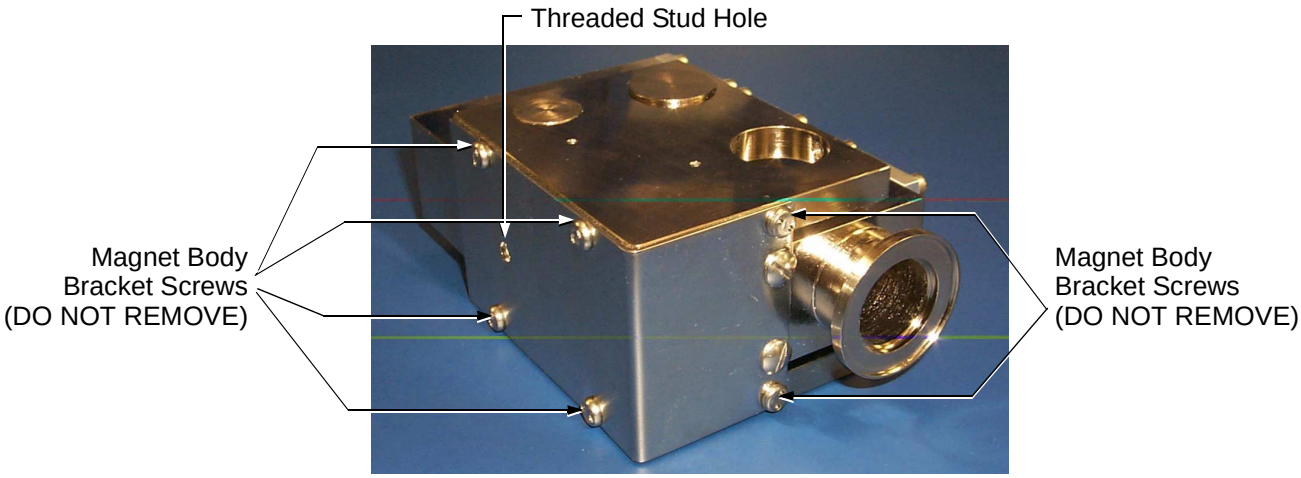

Figure 5-52 Magnet Assembly Bracket Screws

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To perform this procedure:

1. Hold the spectrometer tube in one hand in the upright position (flange caps and contacts up).
2. With the other hand, pick up the magnet assembly and orient it so that the GA pole pieces are the first part to slide onto the spectrometer tube (Figure 5-53).
3. Carefully slide the magnet assembly all the way onto the spectrometer tube.

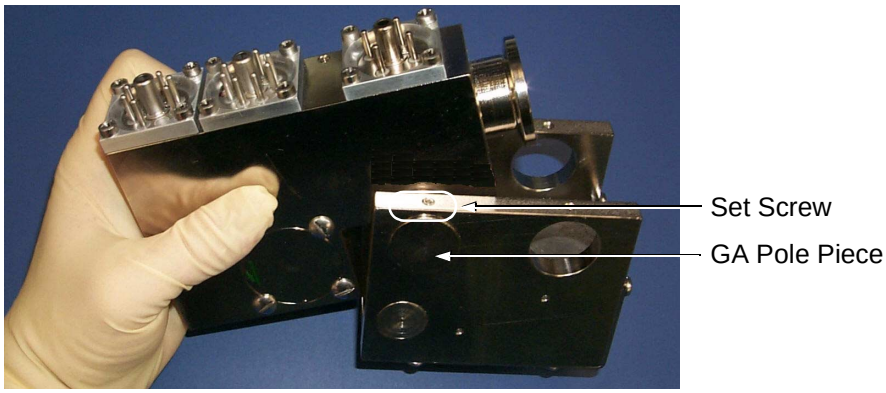

Figure 5-53 Set Screw and GA Pole Piece

4. Center the spectrometer tube in the middle of the magnet assembly.
5. Check to see that the threaded stud hole in the magnetic assembly aligns with the hole in the spectrometer tube by trying to insert and tighten the threaded stud.
6. Adjust the alignment if necessary.

NOTE

Do not leave the threaded stud with Teflon stand off in the spectrometer tube at this point.

7. If you previously backed out the set screws to remove the magnet assembly from the spectrometer tube body, re-tighten them fully.

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8. Replace the 2 slotted magnet body bracket screws on the front of the magnet assembly to complete mounting the magnet assembly to the spectrometer tube (Figure 5-54).
9. Place the 8-32 threaded stud with Teflon standoff into the bottom of the spectrometer tube and tighten it using a 5-64 Allen wrench.

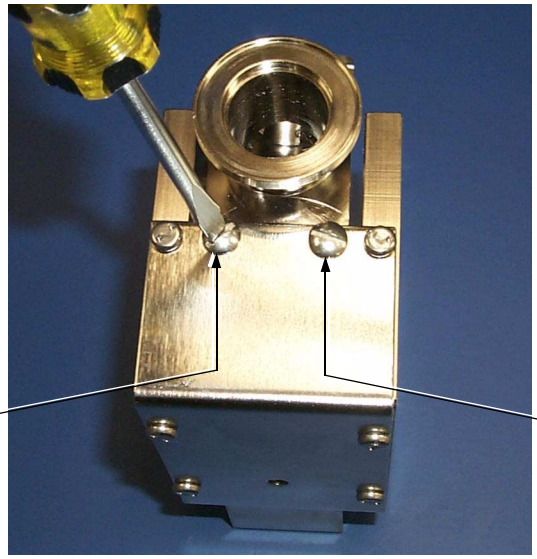

Figure 5-54 Screws for Mounting Magnet Assembly to Spectrometer Tube

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5.10.6 Re-Installing the Spectrometer Tube

To perform this procedure:

1. Place the spectrometer tube assembly onto the shelf with the flange end facing the manifold elbow and the threaded stud inserted into the hole in the shelf.
2. Place the O-ring onto the centering ring.
3. Insert the centering ring assembly onto the spectrometer tube flange end.
4. Attach the spectrometer tube to the turbo-to-spec tube manifold and replace the NW-25 quick clamp.
5. Place the washer, lock washer and wing nut onto the threaded stud and tighten it fully.
6. Place the ground cable onto the spectrometer tube and fasten it with the slotted screw.
7. Replace the connectors, being sure to replace each one onto its proper item. The connectors and the center posts are keyed to go on only one way.
8. Close the vacuum by tightening the knurled nut on the turbo pump.
9. Close the front panel as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
10. Connect the pump power plugs to the rear panel if they are not connected already.
11. Connect mains power.
12. Turn the leak detector on and wait for the system to be ready.
13. Allow the pumps to warm up if the detector has been off for some time.
14. Perform the system pressure gauge calibration described in Section 9.3.1 “System Pressure Gauge Calibration Procedure” on page 9-7.
15. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
16. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

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Section 6. Test Port Thermocouple Gauge

The Test Port Thermocouple Gauge monitors pressure at the test port. The test port pressure is shown on the test port pressure display bar graph and touch panel Home Screen. For more information, see the *Model 979 Instruction Manual*.

6.1 Removing the Test Port Thermocouple Gauge

To remove the Test Port Thermocouple Gauge it is not necessary to remove the front panel completely. However take care not to place tension on the front panel display PCB harness.

To perform this procedure:

1. Press the VENT button on the front panel to vent the leak detector.
2. Disconnect the mains power supply and make sure all pumps are off.

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

CAUTION *Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.*

3. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1.

NOTE *To open more room to access the gauge, you can also remove the rear panel. (See Section 3.3 “Removing the Rear Panel” on page 3-5.)*

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4. Grasp the plug and remove the plug and the thermocouple gauge from the valve block (Figure 6-1).

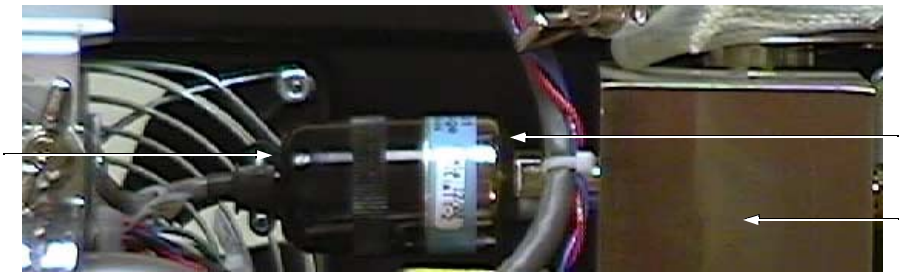

Figure 6-1 Test Port Thermocouple Gauge, Plug, and Valve Block

5. Disconnect the plug from the thermocouple gauge.
6. Remove the O-ring and backing ring from the thermocouple gauge (Figure 6-2).

Figure 6-2 Test Port Thermocouple Gauge O-ring and Backing Ring

CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task. This prevents scratching of any sealing surfaces.

Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.

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7. Examine the O-ring for wear. If necessary, use a new O-ring, otherwise clean the O-ring.

NOTE

Varian Vacuum Technologies recommends replacing all O-rings during routine maintenance or during any maintenance procedure requiring that O-rings be removed.

8. Before reusing O-rings or installing new O-rings, wipe them down with a lint-free cloth before installation to ensure that no foreign matter is present to impair the seal.
9. If applicable, apply a small amount of Apiezon L grease and wipe the O-rings “shiny” dry.
10. Examine the backing ring. If there are nicks or other signs of wear, replace it.
11. If necessary, use a VacuSolv wipe to remove any dirt or foreign matter from the backing ring, otherwise wipe it with a lint-free cloth.

6.2 Replacing the Test Port Thermocouple Gauge

To replace the test port thermocouple gauge:

1. Place the backing ring and then the O-ring (Figure 6-3) onto the end of the new thermocouple gauge and move them down toward the gauge as far as they will go.

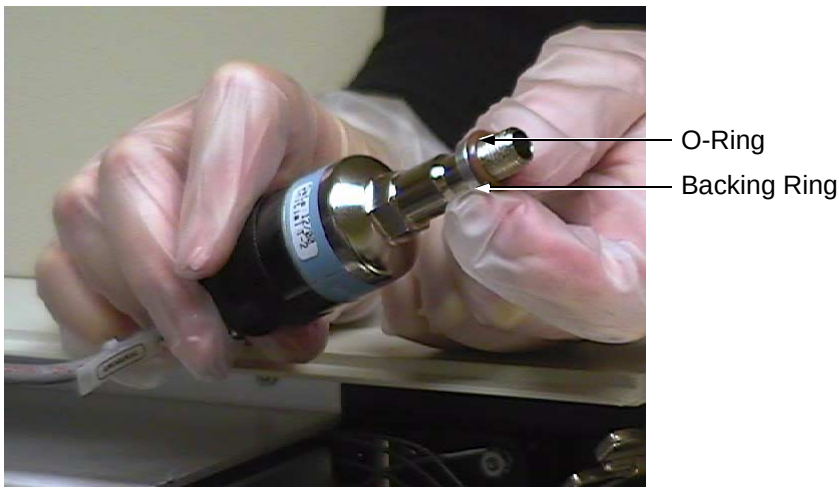

Figure 6-3 Test Port Thermocouple Gauge O-Ring amd Backing Ring

2. Place the plug connector onto the thermocouple gauge. The center post is keyed so it goes only one way.
3. Insert the thermocouple gauge into the valve block. Be sure it is firmly seated.
4. Replace the rear panel if it was removed (Section 3.5.2 “Replacing the Rear Panel” on page 3-7).

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5. Close the front cover using the procedure in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
6. Connect the pump power plugs to the rear panel if they are not connected already.
7. Connect mains power.
8. Turn the leak detector on and wait for the system to be ready.
9. Allow the pumps to warm up if the detector has been off for some time.
10. Perform the test port pressure thermocouple gauge calibration described in Section 9.3.2 “Test Port Pressure Thermocouple Gauge Calibration Procedure” on page 9-8.
11. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
12. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

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Section 7. The Varian Platform

The 979 uses Varian Vacuum Technologies' Platform leak detector electronics architecture to operate the spectrometer assembly, control the mechanical and high vacuum pumps, control the valve block, and provide leak rate and system status information to the operator interface. The Platform is a collection of printed circuit boards that operate using the PC/104 bus structure to perform the various functions of a helium mass spectrometer leak detector.

7.1 Location of Circuit Boards

Most of the boards that make up the Varian Platform are located in the card cage, which is accessed from the left side of the leak detector (Figure 7-1).

Figure 7-1 979 Interior: Side View of Card Cage

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The boards are identified in Figure 7-2.

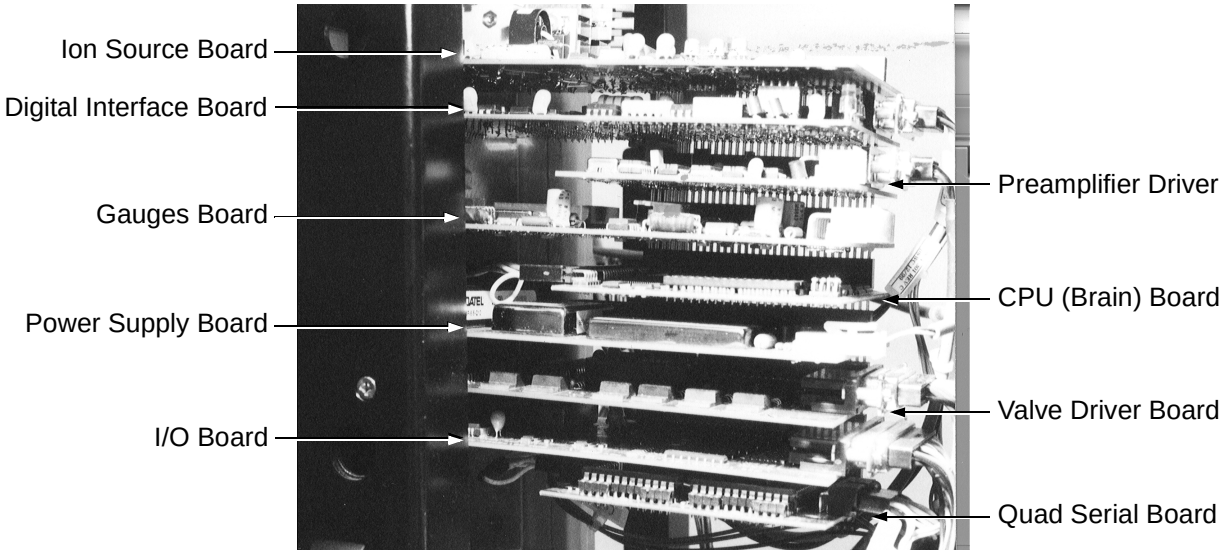

Figure 7-2 979 Circuit Boards in Card Cage

The Turbo Controller Board is located in the front of the unit, directly under the shelf that the spectrometer tube sits on. The boards that control the Touch Panel Screen and the Controls and Bar Graph Displays are located inside the front panel.

Contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN for troubleshooting assistance to determine which circuit board is at fault.

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7.2 Removing the Card Stack from the Card Cage

CAUTION *The circuit boards are static sensitive devices. Wear a grounding device when accessing any circuit board.*

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

To perform this procedure:

1. Disconnect the mains power supply and make sure all pumps are off.
2. Remove the front panel as described in Section 3.2 “Removing the Front Panel” on page 3-3.
3. Remove the rear panel as described in Section 3.3 “Removing the Rear Panel” on page 3-5.
4. Remove the side panel as described in Section 3.4 “Removing the Side Panel” on page 3-6.
5. Turn the two screws that hold the card cage bracket and remove the bracket (Figure 7-3).

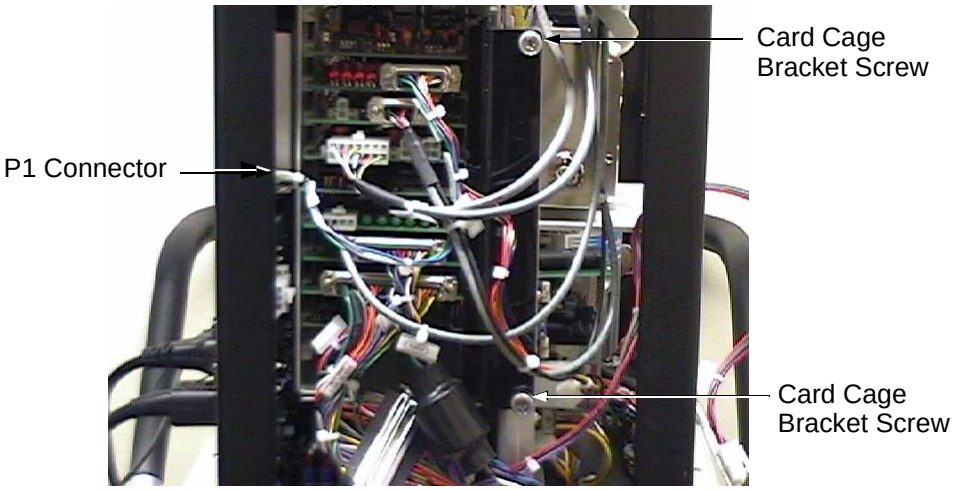

Figure 7-3 Card Cage Bracket and Connectors on Front of Boards

6. Remove the P1 connector from the side of the chassis (Figure 7-3).

   The release clip is on the left hand side of the connector. Press it and pull the connector up and out. Be sure to take note of its location as it fits into other board connections.

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7.2.1 Removing the Connections from the Front of the Boards

To perform this procedure:

1. Remove the first 5 connectors from the front (Figure 7-3 on page 7-3) boards, that is, the Digital Interface Board, Preamplifier Board (short), Gauges Board, Power Supply Board and the Valve Driver Board.
   - ❑ Remove a molex connector by pressing the release tab and pulling the connector out.
   - ❑ Remove the DB-sub connectors using a small slotted screw driver to back out the screws just enough to remove the connection (do not remove the screws completely).

CAUTION *The connector on the I/O Board is a shared connector with the Quad Serial Board. Do not remove the connection to the I/O Board or to the Quad Serial Board (not visible in Figure 7-4).*

2. Disconnect the shared power cable (Figure 7-4) backing the screws out just enough to separate the connection.

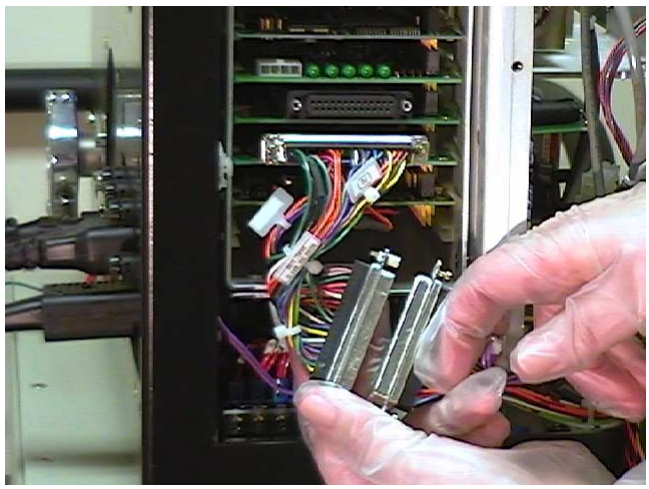

Figure 7-4 Shared Power Cable

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7.2.2 Removing the Connections from the Back of the Boards

There are 5 power connectors and two molex connectors that are visible from the back of the boards. Access to these connectors is easy from the top front or rear of the 979.

To perform this procedure:

3. Press the release tab and pull the connector straight off.

   The Ion Source (top) and I/O Boards have molex connectors (Figure 7-5).

4. Pull the power connectors straight off of the boards (Figure 7-5).

   There are no latches or screws. There are 5 visible power connections.

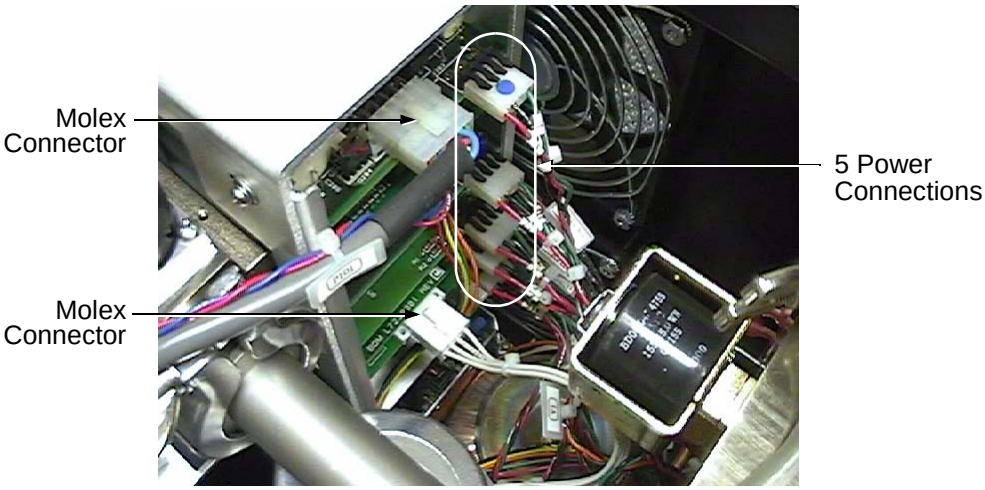

Figure 7-5 Connectors on Rear of Boards

The CPU is a short board. It is sandwiched between two longer boards. The power connection is not accessible from here, although you can see the wire that leads to it (Figure 7-6).

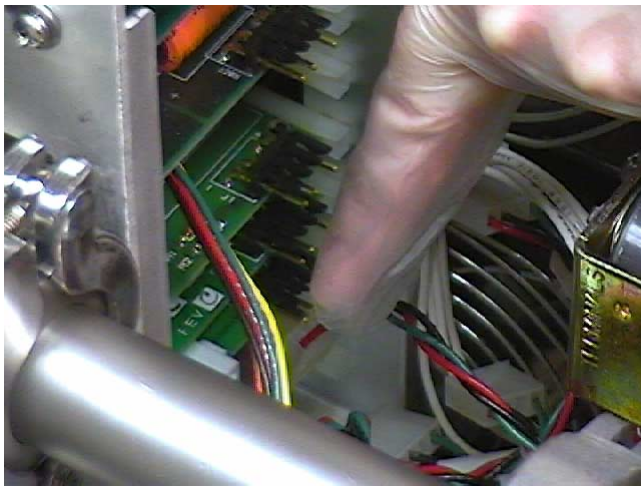

Figure 7-6 Wire to CPU Power Connection

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7.2.3 Removing the CPU Board Power Connection

You can disconnect the CPU power connection once all other connections have been removed. Once again, work from the side of the 979.

To perform this procedure:

1. Back the cards out of the card cage enough so that the short boards are out of the card guides (Figure 7-7).

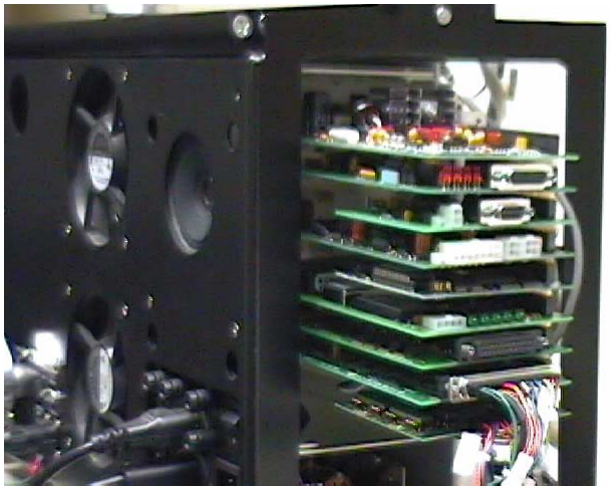

Figure 7-7 Boards Partially out of Card Cage

2. Locate the CPU power connection (Figure 7-8).

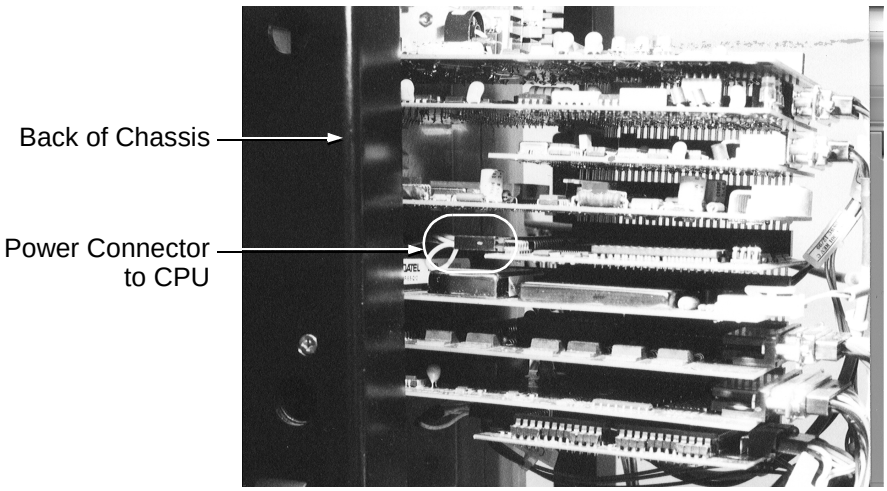

Figure 7-8 CPU Power Connector

3. Pull the connection off toward the back of the boards (there is no release).

7.2.4 Removing the Card Stack

To remove the card stack:

1. After all the connections have been removed, pull the card stack the rest of the way out of the cage holding both sides of the stack (Figure 7-9).
2. Place the stack on a non-magnetic, static-free surface.

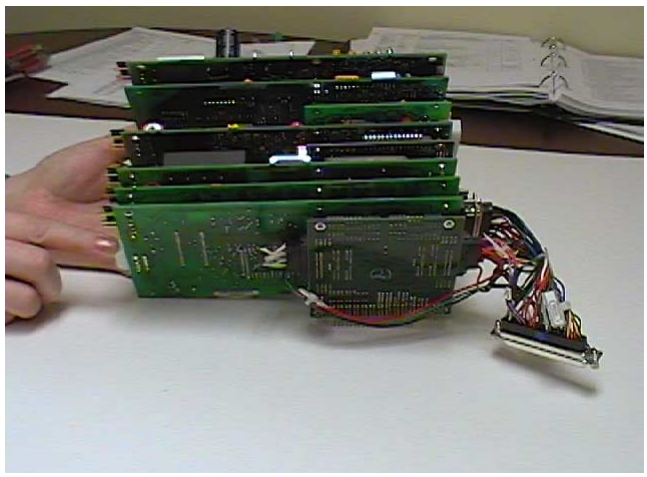

Figure 7-9 Card Stack Removed from Card Cage

NOTE

The boards are all connected on one side, and can fan out on the other side. Be aware of this fact when you are ready to insert the boards back into the card cage.

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7.3 Replacing a Board

To replace a board you must first remove the card stack as described in Section 7.2 “Removing the Card Stack from the Card Cage”. The location of the boards is shown in Figure 7-10.

Figure 7-10 Boards in Card Cage

To perform this procedure:

1. Locate the board you have to replace.
2. Separate the board from the others being careful not to bend the pins.
3. Replace the board into the stack being careful not to bend the pins.
4. Replace the rest of the stack.
5. Be sure all boards are firmly seated.

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7.4 Replacing the Card Stack into the Card Cage

The card stack has 11 guides. The left and right guides are slightly offset from each other with the left guides a bit closer to the front of the card cage than the right guides. This makes it easier to insert the boards. Figure 7-11 shows the inside of the card cage with the CPU power connector laying inside.

NOTE

Remember, the stack will tend to fan out on the left side. It is fully connected and stable on the right side. Lead the left side into the card cage first. The guides are offset with the left guides forward of the right to make inserting the stack easier.

Figure 7-11 Card Cage Interior

Work from the side of the 979.

To perform this procedure:

1. With the card stack intact, hold the stack from the sides with both hands.
2. Orient the stack with the Ion Source Board on the top and the front of the cards (shared power connection) facing you.
3. Place the left side into the guide first.

   The ion source board (top) goes into the second row of guides. Check to see that all cards are sliding into the guides.
4. As the boards slide in, place the right side of the stack into the guides.

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5. When the boards are part way in, stop to insert the CPU power connection.
6. Move to the front or back of the 979, reach in from the back of the card cage and lay the CPU power connection up onto the Power Supply board so you can reach it from the left side of the stack.
7. Move to the left side of stack and replace the CPU power connection.
8. Continue to slide the boards into the rack the rest of the way, making sure that the short boards also fall into the guides.
9. Replace the 5 power connections and the two molex connections on the back of the cards (Figure 7-5 on page 7-5).
10. Connect the shared power source, tighten the screws.
11. Connect the DB-sub connectors and tighten the screws.
12. Place the P1 connection back into the side of the chassis.
13. Replace the card cage bracket and hand turn the screws to tighten them.
14. Replace all panels as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
15. Connect the pump power plugs if they were removed.
16. Connect mains power.
17. Turn power on and let the pumps warm up and come up to speed.
18. Calibrate the leak detector using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.

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7.5 Replacing the Turbo Controller Board

The turbo controller board is located in the front of the 979 just beneath the shelf that the spectrometer tube sits on. The front panel must be opened, but it is not necessary to remove it completely. If it is not removed completely, be careful not to place pressure on the touch panel display harness.

CAUTION *The circuit boards are static sensitive devices. Wear a grounding device when accessing any circuit board.*

7.5.1 Removing the Turbo Controller Board

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

To perform this procedure:

1. Disconnect the mains power supply and make sure all pumps are off.
2. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1.
3. Remove the P15 molex connector (Figure 7-12). Press the release tab and pull the connector straight off.
4. Being careful not to pull the wires, remove the 2 power connectors, P9 and P8, shown in Figure 7-12.
5. If the connectors are not labeled, label them now.

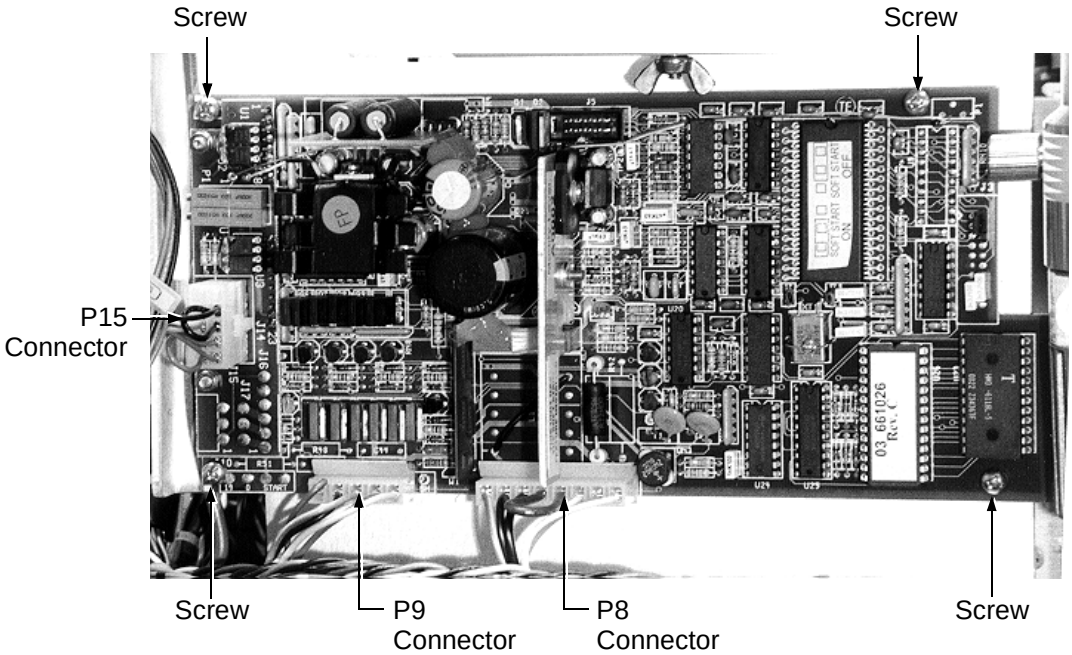

Figure 7-12 Turbo Controller Board

6. Remove the 4 screws that connect the turbo board to the back panel.

   There are washers in the back of the board as well as behind the screws.

7. Remove the turbo controller board. Discard it according to proper regulations.

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7.5.2 Installing the Turbo Controller Board

To perform this procedure:

1. Place a washer on the front of each screw.
2. Place the screws into the holes in the turbo board.
3. Place a washer on the back of each screw.
4. Place the turbo controller board against the back panel.
5. Tighten the four screws.
6. Replace the three connectors P15, P9, and P8.
7. Replace the front panels as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
8. Connect the pump power plugs if they were removed.
9. Connect mains power.
10. Turn the power on and let the pumps warm up and come up to speed.
11. Calibrate the leak detector using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.

7.6 The Touch Screen and Control Panel Assemblies

The front panel controls and touch screen are made up of two assemblies:

- ❑ Touch Screen Assembly
- ❑ Control Panel Assembly

To determine which assembly must be replaced, contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN for troubleshooting assistance.

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7.6.1 Removing the Touch Screen Assembly

CAUTION *The circuit boards are static sensitive devices. Wear a grounding device when accessing any circuit board.*

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

To perform this procedure:

1. Disconnect the mains power supply and make sure all pumps are off.
2. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1.
3. Remove the PCB harness molex connector (Figure 7-13).
4. Remove the front panel and place it carefully on a clean surface.

   Figure 7-13 shows the Touch Screen Assembly. Figure 7-13 shows the PCB harness still attached to the front panel. At this point, however, it is already removed.

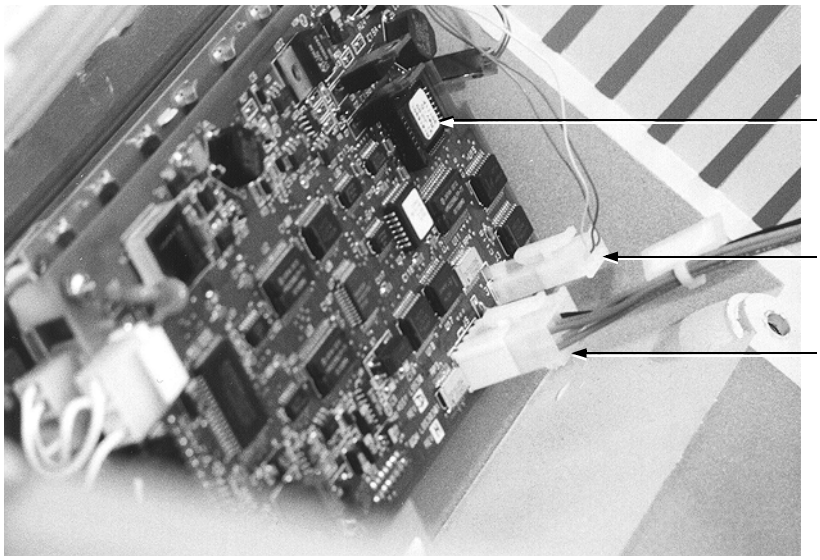

Figure 7-13 Touch Screen Assembly

5. Remove the 3-pin molex display contrast connector from the touch screen assembly (Figure 7-13).
6. Locate the connection that runs from the control panel assembly to the side of the touch screen assembly (Figure 7-14 on page 7-14).

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7. Check to see if the connection at the touch screen assembly is labeled “This side up”. If not, label or otherwise mark it so it can be reconnected properly.
8. Pull the connection straight out.

   There are no latches or screws. Figure 7-14 shows the grounding strap still attached to the front panel. At this point, however, it has already been removed.

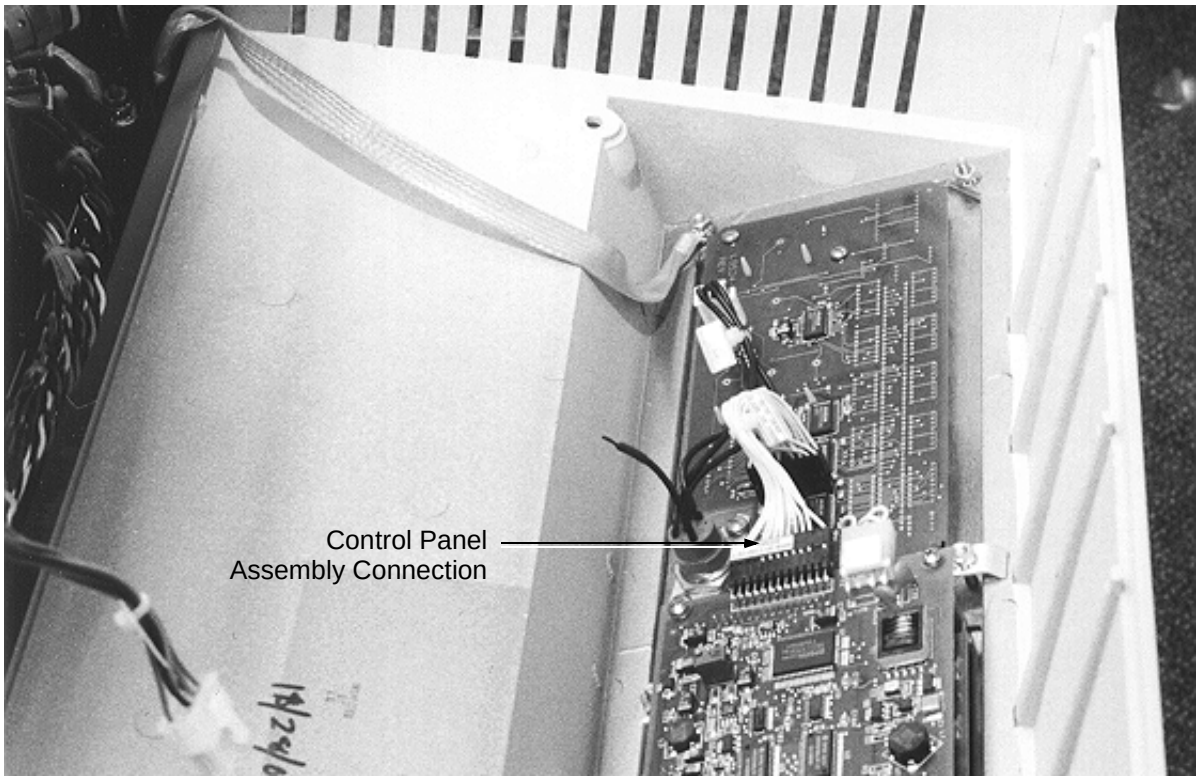

Figure 7-14 Control Panel Assembly (Right)

9. Back out the 4 Phillips screws at the corners of the touch screen assembly enough to release the assembly from the front panel.
10. Once you release the screws, the assembly easily slides apart.

    To avoid this, grasp the assembly holding your hands around the glass and the top board.
11. Remove the touch screen assembly as one unit from the front panel.
    - ❑ If you are returning it, remove the shipping nuts from the new touch screen assembly and place them on the screws of the old assembly.
    - ❑ If you are not returning it, discard it in accordance with proper regulations or procedures.
12. Being careful not to bend the pins, remove the software chip (Figure 7-13 on page 7-13) using a PLCC chip extractor, such as the AMP 821903-5.

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7.6.2 Replacing the Touch Screen Assembly

To perform this procedure:

1. Place the software chip onto the touch screen display board at the position labeled U10. Be sure it is fully seated.
2. Remove the protective plastic sheet from the glass screen.
3. Remove the shipping nuts from the touch screen assembly if you have not done so already.
4. Once you remove the shipping nuts, the assembly easily slides apart.

   To avoid this, grasp the assembly holding your hands around the glass and the top board.
5. Place the touch screen assembly face down into the front panel.

WARNING *Do not overtighten the touch screen assembly screws. Although the touch panel display is made of industrial strength glass, it could break if the screws are overtightened.*

6. Tighten the 4 Phillips screws at the corners of the touch screen assembly.
7. Insert the connector from the control panel assembly into the side of the touch screen assembly display board (Figure 7-14).

   Be sure to orient this connector properly. It fits both ways. It should be labeled “This side up”, or otherwise marked as stated in Section 7.6.1 “Removing the Touch Screen Assembly”, Step 7 on page 7-14.
8. Insert the 3-pin molex connector from the display contrast connector into the touch screen display board (Figure 7-13 on page 7-13).
9. Insert the PCB harness connector into the touch screen display board.
10. Replace the front panel as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
11. Connect the pump power plugs if they are not already connected.
12. Connect mains power.
13. Turn the leak detector on and wait for the system to be ready.
14. Allow the pumps to warm up if the detector has been off for some time.
15. Calibrate the system as described in Section 9.1 “Calibrate the 979” on page 9-1.

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7.6.3 Removing the Control Panel Assembly

CAUTION *The circuit boards are static sensitive devices. Wear a grounding device when accessing any circuit board.*

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

To perform this procedure:

1. Disconnect the mains power supply and make sure all pumps are off.
2. Remove the touch screen assembly following the procedure described in Section 7.6.1 “Removing the Touch Screen Assembly” on page 7-13 through Step 11.
3. Place the touch screen assembly down carefully in a safe place.

   If you have four 6-32 size nuts, attach them to the screws and tighten them so the assembly stays together.
4. Remove the 4-pin Key Switch power molex connector by pressing the release tab and pulling the connector up and off of the board (Figure 7-15).

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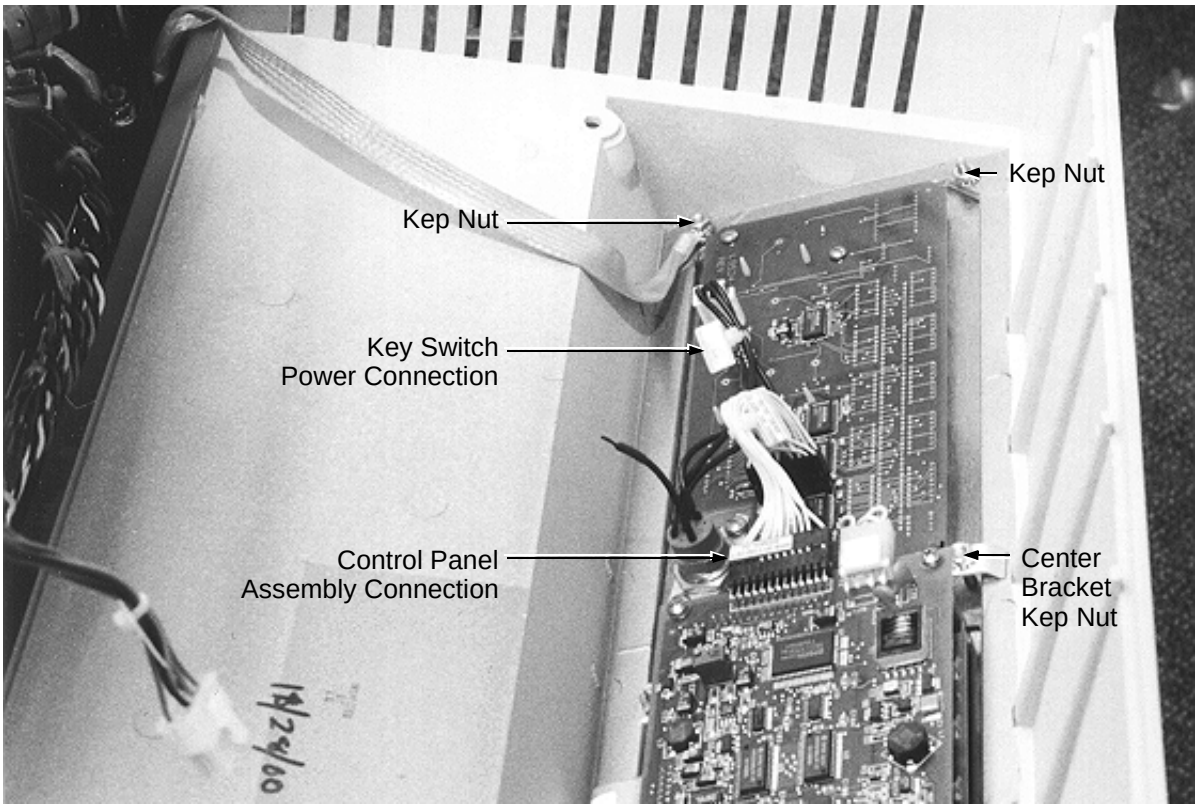

Figure 7-15 Control Panel Assembly (Right)

5. Remove the 4 corner 8-32 kep nuts using an 11-32 nut driver (two of the corner kep nuts are not visible in this view).
6. Remove the 8-32 kep nut located on the center bracket (Figure 7-15).
7. Remove the control panel assembly.

7.6.4 Replacing the Control Panel Assembly

To perform this procedure:

1. Place the control panel assembly face down into the front panel.
2. Replace the 4 corner kep nuts and the center bracket kep nut and tighten them fully using an 11-32 nut driver (Figure 7-15).
3. Place the 4-pin Key Switch power molex connector into the connection on the control panel assembly board.
4. Replace the touch screen assembly following Step 2 through the end of the procedure in Section 7.6.2 “Replacing the Touch Screen Assembly” on page 7-15.

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Section 8. Internal High Speed Turbo and Mechanical Pumps

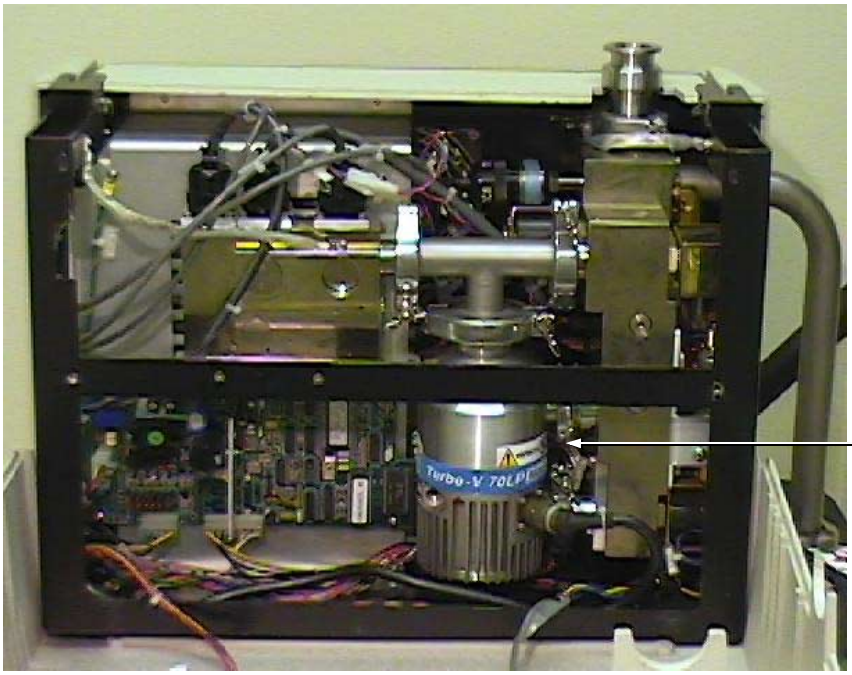
The Model 979 has an internal high speed turbo pump and, depending upon your system's configuration, either one or two mechanical pumps.

NOTE

The photos in this section depict the Turbo-V 70D and the Turbo-V 70LD pumps. Only the Turbo V70LPM is available.

8.1 Removing the Turbo Pump

The turbo pump is located in the right front of the 979 (Figure 8-1). It sits up in the air supported by its connections via the manifold to the spectrometer tube and via connection to the valve block. To remove the Turbo Pump, you must disconnect the spectrometer tube and move it away from the turbo-to-spec tube manifold, remove the manifold, disconnect pump power, and disconnect the turbo pump from the valve block.



Turbo Pump

Figure 8-1 Turbo Pump

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To perform this procedure:

WARNING *Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.*

1. Disconnect the mains power supply and make sure all pumps are off.
2. Open the front panel as described in Section 3.1 “Opening the Front Panel” on page 3-1.

CAUTION *Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.*

NOTE *To remove the turbo pump it is not necessary to remove the front panel completely, however take care not to place tension on the front panel display PCB harness.*

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8.1.1 Moving the Spectrometer Tube Assembly

The spectrometer tube operates at a very high vacuum produced by the high vacuum pump. Service of the spectrometer tube requires that this vacuum be vented to the atmosphere.

To perform this procedure:

1. Vent the spectrometer tube (Figure 8-2) by turning the knurled nut on the turbo pump (knurled nut not shown in this view) approximately 1/4 turn counterclockwise.

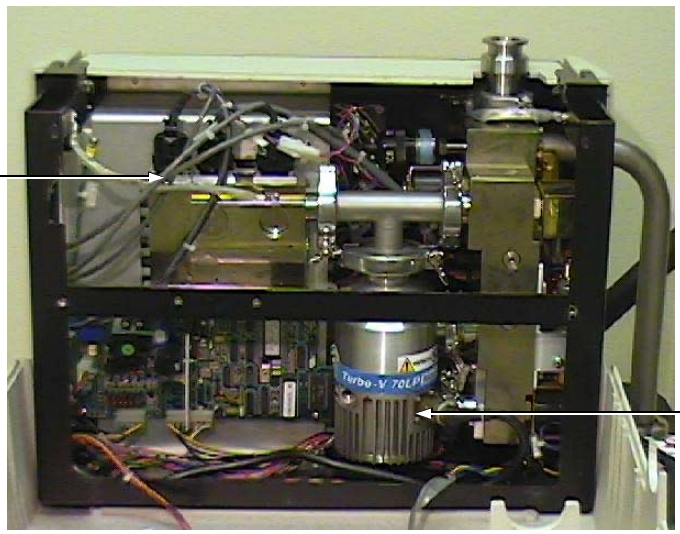

Figure 8-2 Spectrometer Tube and Turbo Pump

The spectrometer tube is located in the center front of the 979 just behind the front panel (Figure 8-2).

It is not necessary to remove the connectors to the Button TC, ion source, or preamplifier. If you want to disconnect them, grasp the plug and not just the cable to remove them. Make sure the cables are labeled (**SYSTEM**, **ION SOURCE**, and **PRE-AMP)** or label them now. For more information, see Section 5.9.1 “Removing the Spectrometer Tube Assembly as Part of Overhaul” on page 5-21.

2. Taking care not to damage the turbo pump controller PCB located underneath the shelf, remove the wing nut, locking washer, and flat washer located underneath the shelf and below the spectrometer tube (Figure 8-3).

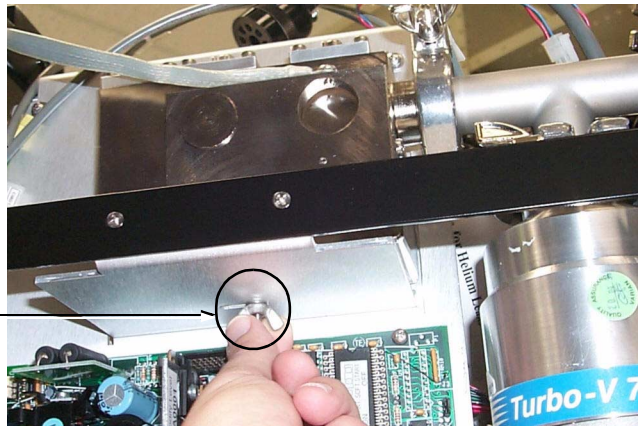

Figure 8-3 Wing Nut

The wing nut is on a threaded stud that screws into the spectrometer tube.

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3. Remove the NW-25 quick clamp to disconnect the spectrometer tube from the turbo-to-spec tube manifold (Figure 8-4).

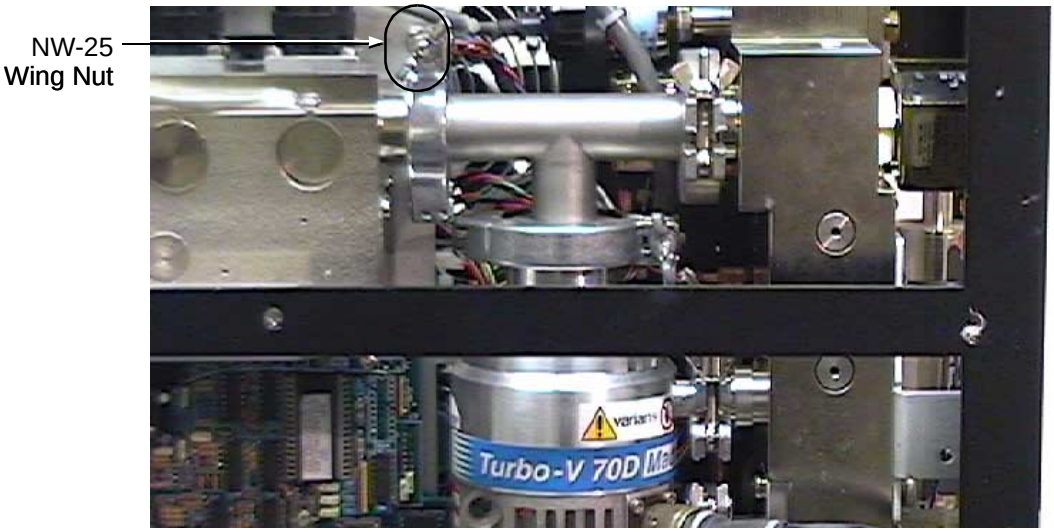

Figure 8-4 NW-25 Quick Clamp on Turbo-to-Spec Tube Manifold

4. Lift the spectrometer tube assembly up and move it to the left, away from the turbo-to-spec tube manifold.
5. Remove the centering ring and O-ring. Place them on a clean surface.

8.1.2 Removing the Turbo-to-Spec Tube Manifold

To perform this procedure:

1. Loosen and remove the NW-16 clamp that connects the turbo-to-spec tube manifold to the valve block (Figure 8-5).
2. Remove the centering ring and O-ring and put them in a safe place.

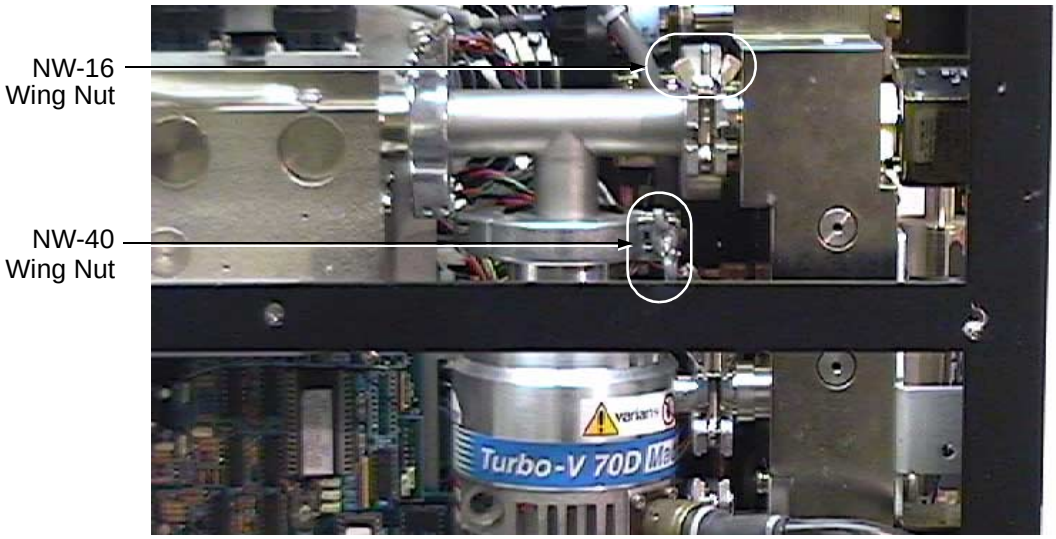

Figure 8-5 NW-25 and NW-40 Quick Clamp on Turbo-to-Spec Tube Manifold

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3. Loosen and remove the NW-40 clamp at the top of the pump that connects the turbo-to-spec tube manifold to the pump (Figure 8-5).
4. Remove the centering ring, O-ring, and manifold.
5. Place the clamps, manifold, centring ring and O-ring on a clean surface.

8.1.3 Removing the Power and Valve Block Connections

CAUTION

Once you remove the power connector, the connection to the valve block is the only thing holding the turbo pump in place. Be sure to hold the turbo pump with one hand before loosening the second clamp to the valve block connection.

To perform this procedure:

1. Remove the power connector from the turbo pump by pushing the green sleeve on the end of the connector in and then turning the sleeve to release the connector (Figure 8-6).
2. Holding the turbo pump with one hand, loosen and remove the upper and lower NW-16 clamps that connects the turbo pump to the valve block (Figure 8-6).
3. Remove the centering rings and O-rings.

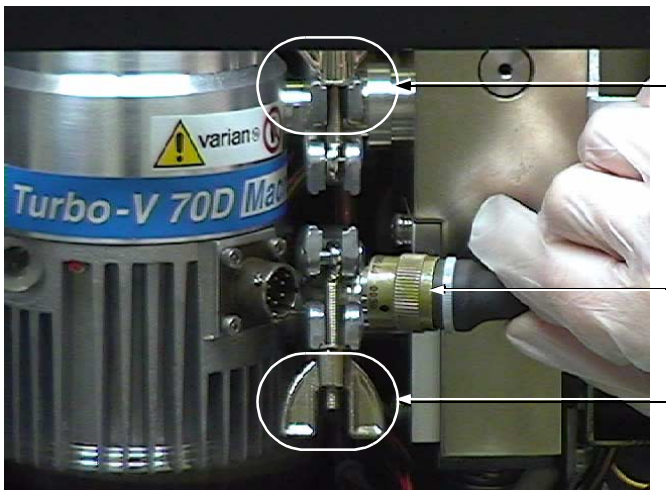

Figure 8-6 Remove the Turbo Power Connection

4. Place the clamps, centering rings, and O-rings on a clean surface.
5. Grasp the turbo pump from the top and lift it up and out of the chassis.

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8.2 Replacing the Turbo Pump

Before you replace the turbo pump, examine and clean all O-rings, centering rings, clamps and the turbo-to-spec tube manifold.

8.2.1 Examining and Cleaning Centering Rings, O-rings and the Manifold

To perform this procedure:

1. Using VacuSolv presaturated cleaning wipes and swabs, thoroughly wipe down all surfaces of the centering rings, clamps and the turbo-to-spec tube manifold.

CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task. This prevents scratching of any sealing surfaces.

Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.

Do not use grease on O-rings that will come in contact with the spectrometer tube.

2. Carefully inspect all O-rings. Replace all damaged O-rings (Figure 8-7).

NOTE

Varian Vacuum Technologies recommends replacing all O-rings during routine maintenance or during any maintenance procedure requiring that O-rings be removed.

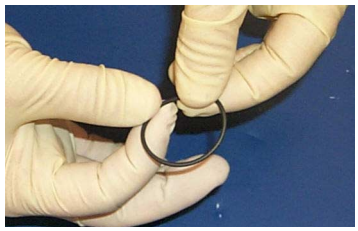

Figure 8-7 Inspecting an O-ring

3. Before reusing O-rings or installing new O-rings, wipe them down with a lint-free cloth to ensure that no foreign matter is present to impair the seal.
4. Place the O-rings on the centering rings.

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8.2.2 Replacing the Turbo Pump

To perform this procedure:

1. Hold the turbo pump by the top with the power connection angled out.
2. Lower the pump through the top of the chassis and position it so that the pump outlets are in line with the valve block connections.
3. While supporting the pump with one hand, use the other hand to place the NW-16 centering ring and O-ring onto the lower valve block connection (Figure 8-8).

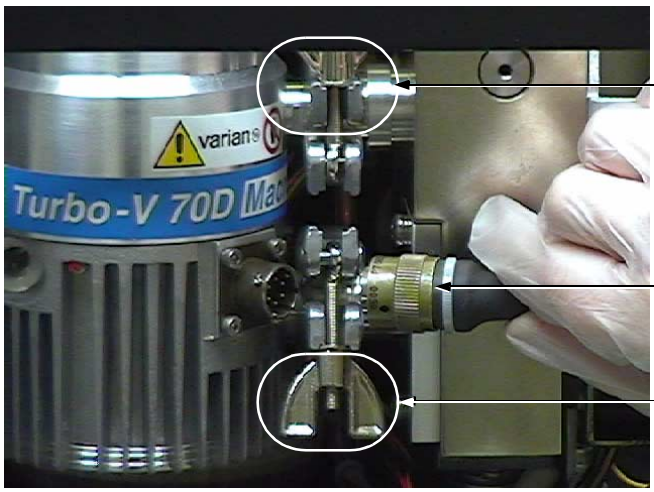

Figure 8-8 Remove the Turbo Power Connection

4. Place the turbo pump outlet against the centering ring.
5. Place the NW-16 clamp onto the connection and tighten the wing nut.

NOTE *At this point, the pump is supported by the valve block connection.*

6. Place the NW-16 centering ring and O-ring onto the upper valve block connection (Figure 8-8).
7. Place the NW-16 clamp onto the connection and tighten the wing nut.
8. Connect the turbo pump power by pushing the power connector onto the pump and then turning the green sleeve until the connector locks into place.

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8.2.3 Replace the Turbo-to-Spec Tube Manifold

Refer to Figure 8-9 while performing this procedure.

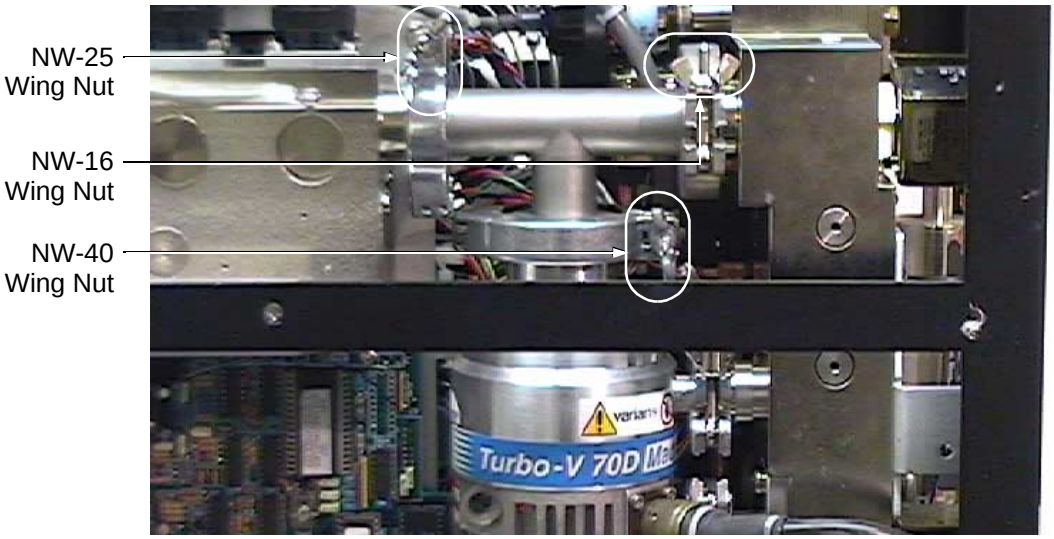

Figure 8-9 Turbo-to-Spec Tube Manifold Connections

To perform this procedure:

1. Place the centering ring and O-ring against the manifold end that connects to the valve block.
2. Place the NW-16 clamp onto the connection. Partially tighten the wing nut.
3. Place the NW-40 centering ring and O-ring onto the top of the turbo pump.
4. Place the turbo-to-spec tube manifold on the O-ring.
5. Place the NW-40 clamp onto the connection and partially tighten the wing nut.

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8.2.4 Replacing the Spectrometer Tube

Refer to Figure 8-9 while performing this procedure.

To perform this procedure:

1. Place the NW-25 O-ring onto the centering ring.
2. Put the spectrometer tube back into position, placing the threaded stud into the hole in the shelf and the flange end toward the turbo-to-spec tube manifold.
3. Place the centering ring and O-ring onto the flange end of the spectrometer tube.
4. Place the turbo-to-spec tube manifold against the centering ring.
5. Place the NW-25 clamp onto the connection and partially tighten it.
6. Check all manifold connections. Ensure they line up so the connections are properly sealed when the wing nuts are fully tightened.
7. Finish tightening the 3 wing nuts.
8. Place the washer, lock washer and wing nut onto the threaded stud and tighten it fully.
9. Place the ground cable onto the spectrometer tube and fasten it with the slotted screw.
10. Close the front cover as described in Section 3.5 “Replacing All Covers and Panels” on page 3-7.
11. Connect the mechanical pump power plugs if they are not connected already.
12. Connect mains power.
13. Turn the leak detector on and wait for the system to be ready.
14. Allow the pumps to warm up if the detector has been off for some time.
15. Calibrate the 979 using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
16. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

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8.3 Replacing the Mechanical Pumps

The system may be configured with a roughing pump and a forepump or just one mechanical pump. The basic replacement procedures are the same, except that you perform them twice.

NOTE

Newer versions of the system include a pump isolation valve. This is not shown in this procedure.

To remove the mechanical pumps:

WARNING

To avoid injury, use proper lifting techniques when moving pumps. Your system may have pumps that require two people to move them safely.

Disconnect power from the 979 before performing any maintenance procedure that requires physically disconnecting any part of the system.

1. Disconnect the mains power supply and make sure all pumps are off.
2. Disconnect the pump power plugs from the rear panel.
3. Loosen the wing nut on the lower NW-25 clamp that connects the pump to the manifold (Figure 8-10).
4. Remove the clamp, centering ring and O-ring.
5. Place the clamp, centering ring and O-ring on a clean surface.

NOTE

If the system is cart mounted, it is not necessary to remove the manifold completely, but it may be easier to maneuver the pump if it is loosened and moved out of the way.

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6. To move the manifold out of the way, loosen the wing nut on the upper NW-25 clamp (Figure 8-10) that connects the manifold to the flexible pipe.

NOTE *Do not remove the clamp.*

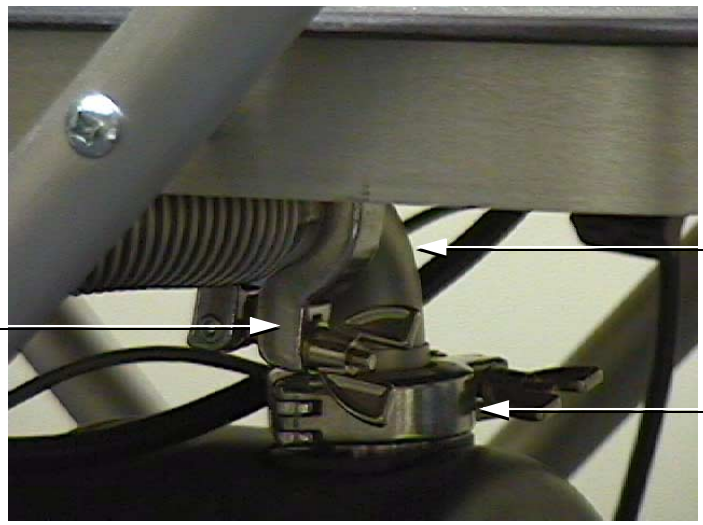

Figure 8-10 Connections at the Top of the Mechanical Pump

7. Swing the manifold out of your way.
8. If the system is mounted on a cart, remove the wing nut on the NW-16 clamp that attaches to the exhaust line (Figure 8-11).

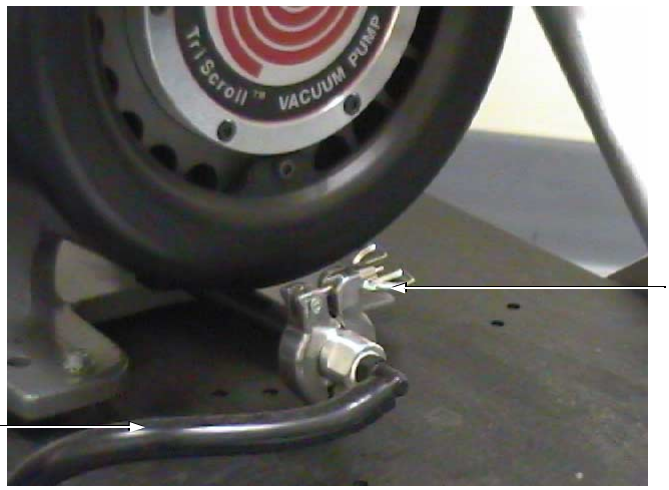

Figure 8-11 Connection at the Bottom of the Pump to Exhaust

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9. If the pumps are mounted on a cart, remove the four 1/4-20 bolts (Figure 8-12).

WARNING *To avoid injury, use proper lifting techniques when moving pumps. Your system may have pumps that require two people to move them safely.*

10. Remove the pump from the cart.

Figure 8-12 One Mechanical Pump on a Cart

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8.3.1 Examining and Cleaning the Centering Ring and O-Ring

To perform this procedure:

1. Examine the centering ring and wipe it clean using a VacuSolv wipe. Let it air dry.
2. Carefully inspect the O-ring (Figure 8-13). If it is damaged, replace it.

NOTE

Varian Vacuum Technologies recommends replacing all O-rings during routine maintenance or during any maintenance procedure requiring that O-rings be removed.

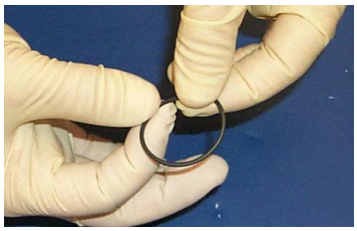

Figure 8-13 Inspecting an O-ring

CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task. This prevents scratching of any sealing surfaces.

Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.

3. Before reusing O-rings or installing new O-rings, wipe them down with a lint-free cloth before installation to ensure that no foreign matter is present to impair the seal.
4. If applicable, apply a small amount of Apiezon L grease and wipe the O-rings “shiny” dry.
5. Place the O-ring onto the centering ring.

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8.3.2 Replacing the Mechanical Pumps

To replace the mechanical pumps:

WARNING *To avoid injury, use proper lifting techniques when moving pumps. Your system may have pumps that require two people to move them safely.*

1. If the pumps are to be mounted on a cart, place the pump on the cart, locating it over the bolt holes. Otherwise, skip to Step 4.
2. Insert and tighten the four 1/4-20 bolts.
3. Connect the exhaust line, attach the NW-16 clamp and tighten the wing nut.
4. If you moved the manifold out of the way to remove the pump, position it over the pump flange.
5. Place the centering ring and O-ring assembly onto the top of the pump.
6. Place the manifold onto the centering ring and O-ring assembly.
7. Replace the lower NW-25 clamp and tighten the wing nut.
8. Tighten the upper NW-25 clamp fully.
9. Connect the pump power cords to the rear panel of the leak detector.
10. Connect mains power.
11. Turn the system on and let the pumps warm up and come up to speed.
12. Calibrate the system using the procedure described in Section 9.1 “Calibrate the 979” on page 9-1.
13. Leak check the assembly before using the 979 for testing.

    Refer to Section 10 “Leak Checking for Reliability”.

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8.4 Changing the Mechanical Pump Fluid

Refer to the *Mechanical Pump Operation Manual*, provided with the pumps that came with your Model 979 Leak Detector. See the 979 accessory item list in this manual for the replacement oil part number.

8.5 Replacing Tip Seals in Dry Mechanical Pumps

Refer to the *Mechanical Pump Operation Manual*, provided with the pumps that came with your Model 979 Leak Detector.

Section 9. Calibration and Manual Tuning

9.1 Calibrate the 979

To calibrate the Model 979, the leak detector should be running and the pumps warmed up for at least 20 minutes, if the leak detector has been off for a period of more than 2 hours.

To perform this procedure:

1. Check the System Info screen to verify that the leak mode reads INT CAL LEAK or EXT CAL LEAK depending on the method you intend to use.
2. If an optional internal calibrated leak is installed, perform a calibration check by pressing the READ STANDARD LEAK button and check the value against the specification.
3. If an external calibrated leak is to be used, it should be mounted on the test port.

   To perform a calibration check:

   - ❑ Press the READ STANDARD LEAK button and check the value against the specification.

   If the specification cannot be met:

   a. Move to the Calibrated Leak Set-Up screen and verify that the correct leak value and method are set.

   b. Press the CALIBRATE button to perform an automated calibration.
4. When calibration is complete, press the READ STANDARD LEAK button and verify that the value is correct.
5. If calibration is still not successful, perform Manual Tuning (Section 9.2 “Manual Tuning” on page 9-2).

If you need more information about calibration, see the *Model 979 Instruction Manual*.

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9.2 Manual Tuning

To manually tune the 979, the system must be in TEST mode with the test port isolated. For additional information about running modes, refer to the *Model 979 Operations Manual*. Note that the actual value of the calibrated leak is not important for the first part of this exercise, only that a maximum value is achieved. You can manually tune the system using commands entered from a host computer (follow the procedure in Section 9.2.2 “Manual Tuning using the Serial Port” on page 9-4) or using the Spectube Manual Tuning Screen.

For additional information about manual tuning, see the *Model 979 Operations Manual*.

9.2.1 Manual Tuning using the Front Panel Touch Screen

Touch the **MANUAL SPECTUBE TUNING** box to display the Manual Spectube Tuning screen (Figure 9-1). This screen is used to manually adjust the parameters of the Ion Source in the spectrometer tube for a maximum helium signal.

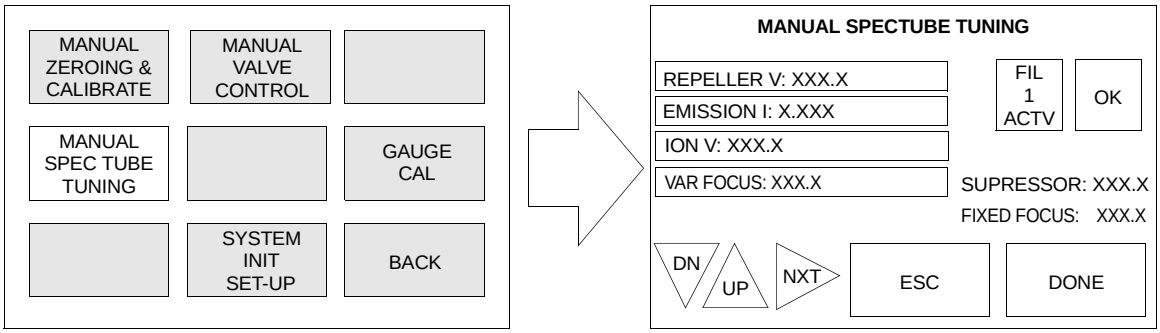

Figure 9-1 Manual Spectube Tuning Screen

CAUTION

Manual tuning is an advanced procedure. If any individual parameter is changed incorrectly, test results will be unreliable.

Before starting the manual tuning process, make note of each parameter value shown on the Manual Spectube Tuning screen so that you can revert to them if necessary.

To perform this procedure:

1. Operate the valves in the vacuum system to rough pump, then expose the calibrated leak to the foreline of the spectrometer assembly high vacuum pump.
2. Wait approximately 20 seconds for the leak to stabilize.
3. Move to the Manual Spectube Tuning Screen (Figure 9-1).
4. Change the ION V parameter to 250.
5. Change the VAR FOCUS parameter value to 190.
6. Select the REPELLER parameter and set it to 340.
7. Change the REPELLER parameter value in 10 V increments.

8. Check the leak rate by observing the leak rate bar graph display.
9. When the maximum leak rate is found, enter that value for the REPELLER value and press OK. See the example in Table 9-1.

CAUTION

Because of the sensitivity of the procedure, manipulating the REPELLER voltage can result in helium not being recognized and the signal continues to rise. The system is actually detecting a gas peak from a gas other than helium.

If the REPELLER voltage continues to increase and does not drop off as shown in Table 9-1, momentarily isolate the leak. Expose the leak again, and repeat Step 6 through Step 9 until valid leak rate values are observed.

Table 9-1 Example: Setting the REPELLER Parameter using the Manual Spectube Tuning Screen

Observed Leak Rate	Enter on Manual Tuning Screen
1.0E-6	REPELLER V: 320 Touch OK
1.2E-6	REPELLER V: 330 Touch OK
1.3E-6	REPELLER V: 340 Touch OK
9.6E-7	REPELLER V: 330 Touch OK
1.3E-6	[Done]

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10. Repeat the procedure in Step 7 through Step 9, this time changing the VAR FOCUS parameter value starting at 190 in 10 V increments (refer to Table 9-1).
11. Repeat the procedure in Step 7 through Step 9, changing the ION voltage parameter value starting at 250 in 10 V increments (refer to Table 9-1).
12. Repeat the procedure in Step 7 through Step 9, changing the EMISSION I parameter value in 100 µA increments starting at 400 µA to find the peak (refer to Table 9-1).
13. Isolate the calibrated leak in the system.
14. Once the system leak rate has decreased to a stable value, press the ZERO button.

    The ZERO indicator LED lights while zeroing takes place and the Home Screen Operating State line displays ZEROING. The zeroing process runs for less than five seconds.
15. When zeroing is complete, expose the calibrated leak to the foreline of the turbo pump again. Wait for the system to stabilize.

16. Press the CALIBRATE button.

    The CALIBRATE indicator LED lights while calibration is taking place and the Home Screen Operating State line displays CALIBRATING.

17. When Calibration is done, press the READ STANDARD LEAK button and verify that the leak rate displayed on the Home Screen matches the value of the calibrated leak.

18. Isolate the calibrated leak and observe the leak rate bar graph display to see that the leak rate decreases to near zero.

19. If the time for the leak rate decay is more than a few seconds, there could be a vacuum leak or the vacuum system might not be fully stabilized.

    If necessary, invoke the ZERO function (from Step 14) again to re-zero the 979.

9.2.2 Manual Tuning using the Serial Port

CAUTION

Manual tuning is an advanced procedure. If any individual parameter is changed incorrectly, test results will be unreliable.

Before starting the manual tuning process, make note of each parameter value shown on the Manual Spectube Tuning screen so that you can revert to them if necessary.

To perform this procedure:

1. Type VENT<CR> and install a known leak in the test port.
2. Enter the value of the external leak using X.XE-X INIT-EXTLEAK<CR> command.
3. If an internal leak is installed, place the test port blank-off flange cap in the test port.
4. Enter the ROUGH<CR> command to operate the valves in the vacuum system to rough pump.
5. Expose (turn on) the calibrated leak to the foreline of the spectrometer assembly high vacuum pump.
6. Enter the STDLEAK<CR> command.
7. Wait approximately 20 seconds for the leak to stabilize.
8. Change the value of the REPELLER parameter in 10 V steps starting at 320 V using the PUT-REPELLER<CR> command.
9. Check the leak rate at each step by using the ?LEAK<CR> command.

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10. When the maximum leak rate is found, enter the same value for the REPELLER but use the INIT-REPELLER<CR> command instead of the PUT-REPELLER <CR> command (refer to Table 9-2).

CAUTION

Because of the sensitivity of the procedure, manipulating the REPELLER voltage can result in helium not being recognized and the signal continues to rise. The system is actually detecting oxygen levels at this point.

If the REPELLER voltage continues to increase and does not drop off as shown in Table 9-1, momentarily isolate the leak. Expose the leak again, and repeat Step 8 through Step 10 until valid leak rate values are observed.

Table 9-2 Example: Setting the REPELLER Parameter Value using J12 Diagnostic Port

Observed Leak Rate	Type
1.0E-6	?LEAK<CR> 320 PUT-REPELLER<CR>
1.2E-6	?LEAK<CR> 330 PUT-REPELLER<CR>
1.3E-6	?LEAK<CR> 340 PUT-REPELLER<CR>
9.6E-7	?LEAK<CR> 330 PUT-REPELLER<CR>
1.3E-6	?LEAK<CR> 330 INIT-REPELLER<CR>
1.3E-6	?LEAK<CR> (Done)

11. Set the Ion Voltage to its nominal value by entering the command, 250 PUT-ION<CR>. Repeat Step 8 through Step 10, changing ION current in 10 V steps (refer to Table 9-2).
12. Set the Variable Focus to its nominal value by entering the command, 190 PUT-FOCUS<CR>. Repeat Step 8 through Step 10, changing FOCUS current in 10 V steps (refer to Table 9-2).
13. Set the EMISSION current to 400 µA using the PUT-EMISSION<CR> command. Repeat Step 8 through Step 10, changing EMISSION current in 100 µA steps (refer to Table 9-2).
14. Turn the leak off to isolate the calibrated leak in the system.
15. Wait for the system leak rate to decrease to a stable value.

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16. Enter ZERO<CR> and check that the SPEC TUBE LED on the front of the control unit flashes while zeroing is in process.

    The zeroing process runs for less than five seconds.

17. When zeroing is complete, turn the leak on to expose the calibrated leak to the foreline of the turbo pump again. Wait for the system to stabilize.

18. Enter CALIBRATE<CR> and check that the SPEC TUBE LED flashes on the front of the control unit while calibration is in process.

19. When calibration is complete, enter ?CALOK<CR>.

    The response should be **yes**.

20. Verify that the leak rate matches the value listed on the tag of the (internal / external) calibrated leak using the ?LEAK<CR> command.

21. Isolate the calibrated leak and, using ?LEAK<CR>, observe that the leak rate decreases to near zero.

NOTE

If the time for the leak rate decay is more than a few seconds, there could be a vacuum leak or the vacuum system might not be fully stabilized. Invoke the ZERO function (Step 14) again to re-zero the 979.

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9.3 Gauge Calibration Procedures

Touch the **GAUGE CAL** box to display the Gauge Calibration screen (Figure 9-2), which is used to perform a calibration on either the system pressure thermocouple (Button TC) or the test port thermocouple gauge.

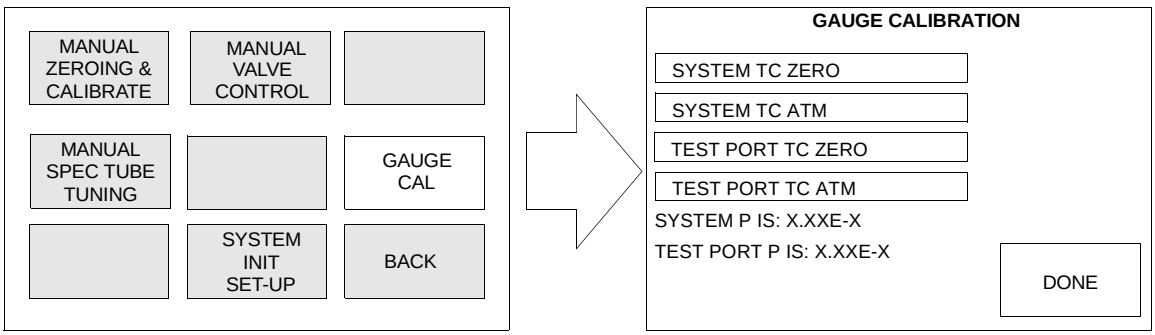

Figure 9-2 Gauge Calibration Screen

9.3.1 System Pressure Gauge Calibration Procedure

This procedure allows for calibration of the system pressure thermocouple (Button TC) gauge. Both the Vacuum and Atmospheric Calibration procedures must be performed in the order written.

9.3.1.1 Vacuum (Low Pressure) Calibration

To perform this procedure:

1. Verify that the leak detector is in the SYSTEM READY condition on the Home Screen (Figure 9-3) and that the test port blank-off flange cap is in place.

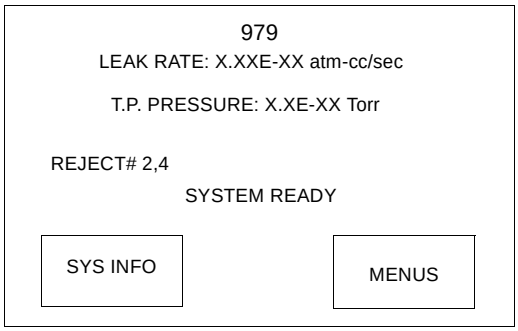

Figure 9-3 979 Touch Panel Home Screen

2. Place the service key (T009) into the key switch and set the key switch to the SERVICE position (see Figure 2-1 on page 2-1).
3. If the system is not already in VENT mode, press the **VENT** button.
4. Press the **TEST** button and verify that the leak detector transfers to FINE TEST mode, displaying 10^{-9} atm cc/sec or lower.
5. Wait approximately five minutes for the vacuum system pressure to stabilize.
6. Move to the GAUGE CALIBRATION screen (Figure 9-2) if you are not already there.
7. Touch the **SYSTEM TC ZERO** box.
   - ❑ A CAL OK indication, to the right of the SYSTEM TC ZERO box, confirms that the calibration was successful.
   - ❑ A CAL NOT OK display is an indication that the calibration was not successful. This could be the result of a defective or contaminated thermocouple gauge, or that the actual pressure was substantially greater than 1 millitorr.
8. Touch **DONE** to leave the screen and return to the previous menu.

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9.3.1.2 Atmospheric Calibration

Calibration of the system pressure thermocouple (Button TC) gauge to atmosphere is only required if the Button TC is replaced or if calibration appears to be off.

To perform this procedure:

1. Upon replacement of the Button TC, unplug the mechanical pump(s) from the back of the 979, and vent the turbo pump by turning the knurled nut 1/4 turn counterclockwise to release the vacuum before powering up the leak detector.
2. Turn the power ON to the 979 and move to the Gauge Calibration touch screen menu.
3. Place the service key (T009) into the key switch and set the key switch to the SERVICE position.
4. Touch the **SYSTEM TC ATM** box.
   - ❑ A CAL OK indication to the right of the SYSTEM TC ATM box confirms that the calibration was successful.
   - ❑ A CAL NOT OK display is an indication that the calibration was not successful. This could be the result of a defective or contaminated Button TC gauge, or that the actual pressure was not at or near atmosphere.
5. Power down the leak detector.
6. Plug the mechanical pumps into the appropriate receptacles and turn on the power.
7. Touch **DONE** to leave the screen and return to the previous menu.

9.3.2 Test Port Pressure Thermocouple Gauge Calibration Procedure

This procedure allows for calibration of the test port pressure thermocouple gauge. Both the Vacuum and Atmospheric Calibrations procedures must be performed in the order written.

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9.3.2.1 Vacuum (Low Pressure) Calibration

To perform this procedure:

1. Verify that the leak detector is in the SYSTEM READY condition (Figure 9-3 on page 9-7) and that the test port blank-off flange cap is in place.
2. Place the service key (T009) into the key switch and set the key switch to the SERVICE position.
3. If the system is not already in VENT mode, press the **VENT** button.
4. Press the **TEST** button and verify that the leak detector transfers to FINE TEST mode, displaying 10^{-9} atm cc/sec or lower.
5. Wait approximately five minutes for the vacuum system pressure to stabilize.
6. Move to the GAUGE CALIBRATION screen (Figure 9-2 on page 9-6) if you are not already there.
7. Touch the **TEST PORT TC ZERO** box.
   - ❑ A CAL OK indication to the right of the TEST PORT TC ZERO box confirms that the calibration was successful.
   - ❑ A CAL NOT OK display is an indication that the calibration was not successful. This could be the result of a defective or contaminated thermocouple gauge, or that the actual pressure was substantially greater than 1 millitorr.
8. Touch **DONE** to leave the screen and return to the previous menu.

9.3.2.2 Atmospheric Calibration

To perform this procedure:

1. Place the service key (T009) into the key switch and set the key switch to the SERVICE position.
2. If the system is not already in VENT mode, press the **VENT** button.
3. Wait approximately ten seconds for the test port pressure to stabilize.
4. Touch the **TEST PORT TC ATM** box.
   - ❑ A CAL OK indication, to the right of the TEST PORT TC ATM box, confirms that the calibration was successful.
   - ❑ A CAL NOT OK display is an indication that the calibration was not successful. This could be the result of a defective or contaminated thermocouple gauge, or that the actual pressure was not at or near atmosphere.
5. Touch **DONE** to leave the screen and return to the previous menu.

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Section 10. Leak Checking for Reliability

Accuracy, reliability, and stability of any mass spectrometer leak detector depends upon the leak-free integrity of its own vacuum system. Inherent helium background and its effect on sensitivity demands elimination of all detectable leaks. If performance degrades during operation or after some part of the vacuum system is opened for service, a methodical leak check eliminates the possibility of a leak as the cause.

NOTE

To ensure reliable testing, the 979 must be leak checked before performing testing after servicing any part of the vacuum system.

10.1 General Suggestions for Leak Checking

The following suggestions apply whether leak checking components, systems, or the leak detector itself:

1. When spraying suspected leak locations:
   - ❑ Always apply helium sparingly.
   - ❑ Since helium rises, start at the highest points first.
   - ❑ Apply helium downstream from the source of a draft first, or deflect the draft until leak checks are completed.
2. If vent grooves exist at flanges or other assembled seals, apply helium to these points (rather than spraying a general area) to:
   - ❑ Obtain the most positive response.
   - ❑ Minimize the use of helium.
   - ❑ Save time in checking.
3. Locate and repair large leaks before attempting to locate extremely small leaks.
4. Limit the search to a general area of the test piece by isolation methods to shorten the time required to locate both large and small leaks. Isolation methods include:
   - ❑ Bagging
   - ❑ Masking
   - ❑ Shielding with tape, plastic film or duct seal (if applied properly)
5. Use only enough helium to reach the leaks. Do not flood the area.

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Appendix A. Assembly Drawings and Bills of Materials

Assembly Drawings and Bills of Materials (BOM) for the 979 are included in this appendix. They are included for reference purposes only and are not intended for repair. Not all parts shown on the drawings and included in the BOM can be ordered by the customer. Most of the field serviceable units are component parts, which have a separate component or kit part number. Check the *Model 979 Instruction Manual*, our e-business site at www.evarian.com, our web site at www.varianinc.com/vacuum, catalog, or contact Customer Service at 1-800-8VARIAN if you have questions. Table A-1 lists the Assembly Drawings included, Table A-2 lists the Bills of Materials included.

Table A-1 Assembly Drawings Included

Assembly	Shows	Sheet #
979 Assembly*	Chassis mounted parts	1 of 6
	PCBs and Card Cage	2 of 6
	Vacuum System Assembly ***Note**: Repair or replacement of any part of the valve block or the gross leak option are not covered in this manual. Neither are customer serviceable parts.*	3 of 6
	Wiring connections	4 of 6
	Sub-assemblies into chassis	5 of 6
	Covers, panels, touch screen display and control assemblies.	6 of 6
Spectrometer Tube*	Spectrometer Tube Assembly	1 of 2**

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***Note**: *Drawings for 979 Assembly and Spectrometer Tube include separate notes or drawings applicable to the 979C.*

****Note**: *Drawing 1 only applies to the 979.*

Table A-2 Bills of Materials Included

Assembly / Configuration	Bill of Materials #
979 V70LPM	**TBD**
BASIC 979 LP HI SENSE PREAMP F/DRY 110 V	R0182404
SPEC TUBE ASSY	L9713303

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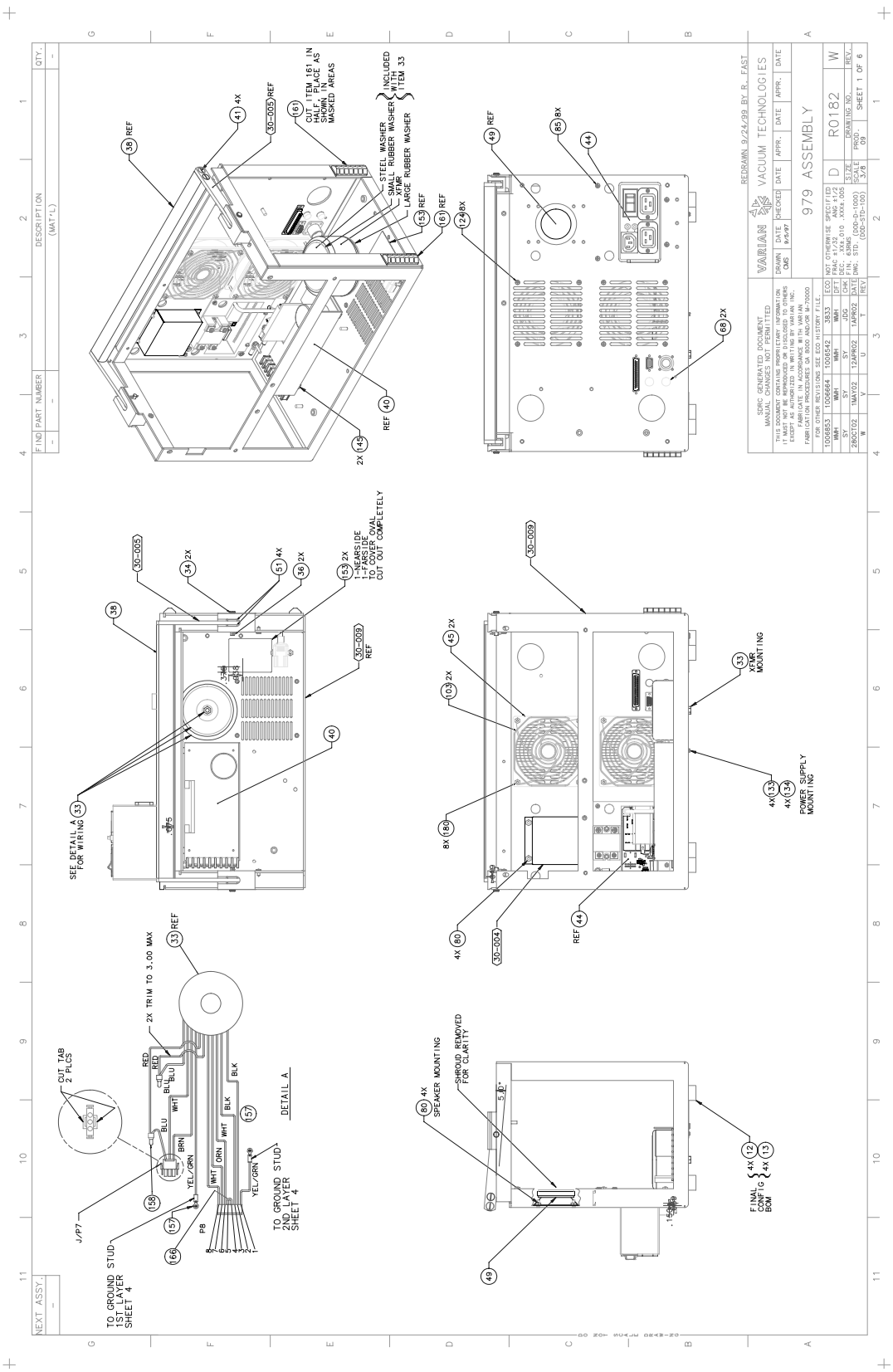
979 ASSEMBLY
VACUUM TECHNOLOGIES
R0182
SEE DETAIL A FOR WIRING
DETAIL A
TO GROUND STUD 1ST LAYER SHEET 4
TO GROUND STUD 2ND LAYER SHEET 4
POWER SUPPLY MOUNTING
XFMR MOUNTING
SPEAKER MOUNTING
SHROUD REMOVED FOR CLARITY
FINAL CONFIG BOM
SHEET 1 OF 6

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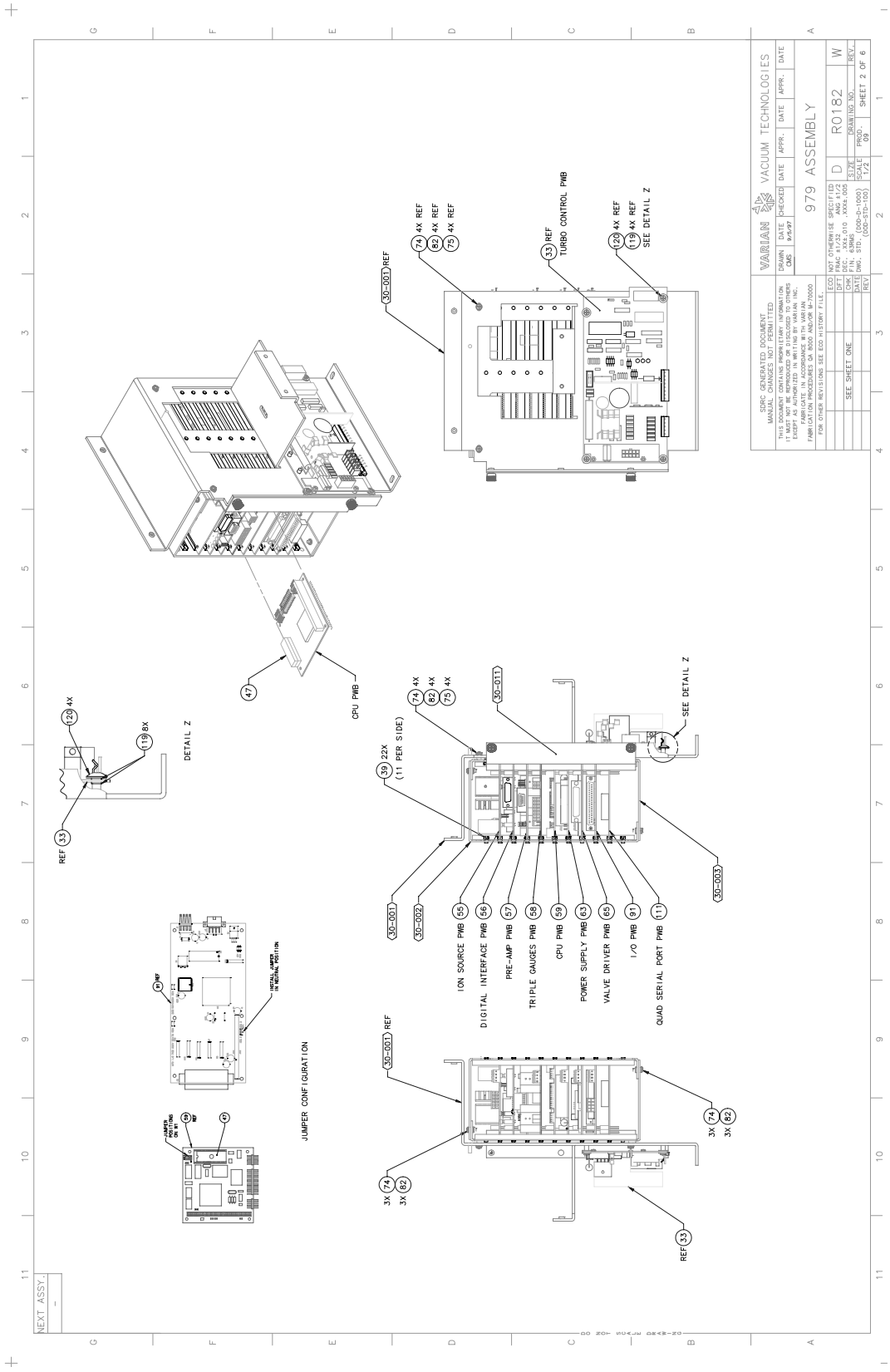
30-001 REF
74 4X REF
82 4X REF
75 4X REF
33 REF
TURBO CONTROL PWB
29 4X REF
119 4X REF
SEE DETAIL Z
47
CPU PWB
29 4X
119 8X
DETAIL Z
REF 33
39 22X
(11 PER SIDE)
74 4X
82 4X
75 4X
30-011
SEE DETAIL Z
30-001
30-002
30-003
ION SOURCE PWB 55
DIGITAL INTERFACE PWB 56
PRE-AMP PWB 57
TRIPLE GAUGES PWB 58
CPU PWB 59
POWER SUPPLY PWB 63
VALVE DRIVER PWB 65
I/O PWB 91
QUAD SERIAL PORT PWB 11
JUMPER CONFIGURATION
30-001 REF
3X 74
3X 82
REF 33
VACUUM TECHNOLOGIES
979 ASSEMBLY
R0182
W
SEE SHEET ONE
SHEET 2 OF 6
NEXT ASSY.

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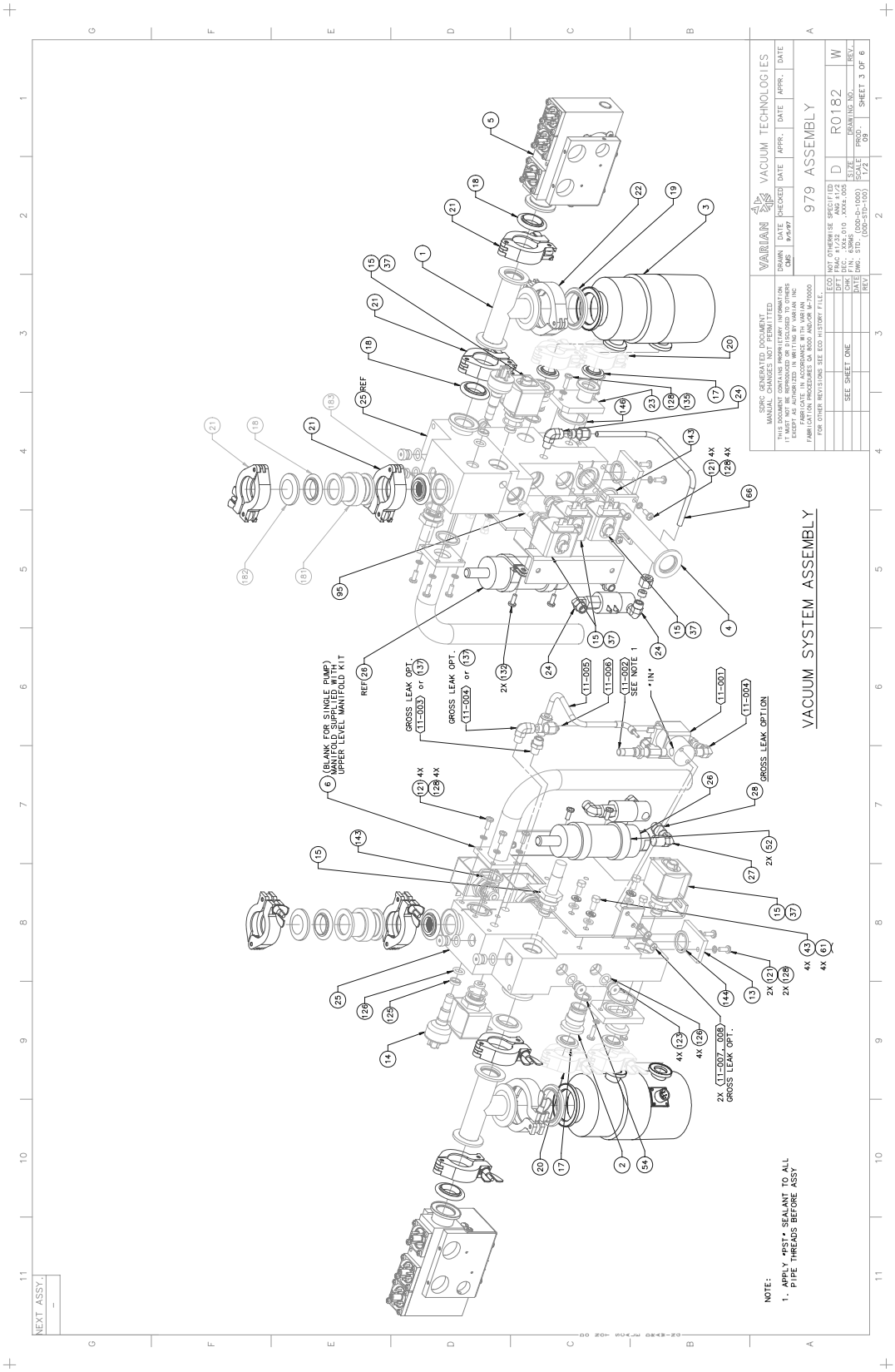
VACUUM SYSTEM ASSEMBLY
979 ASSEMBLY
VARIAN
VACUUM TECHNOLOGIES
R0182
SHEET 3 OF 6
NOTE:
1. APPLY "PST" SEALANT TO ALL PIPE THREADS BEFORE ASSY.
(BLANK FOR SINGLE PUMP) MANIFOLD SUPPLIED WITH UPPER LEVEL MANIFOLD KIT
GROSS LEAK OPT. (11-003) or (13)
GROSS LEAK OPT. (11-004) or (13)
GROSS LEAK OPTION
SEE NOTE 1
"IN"
NEXT ASSY.

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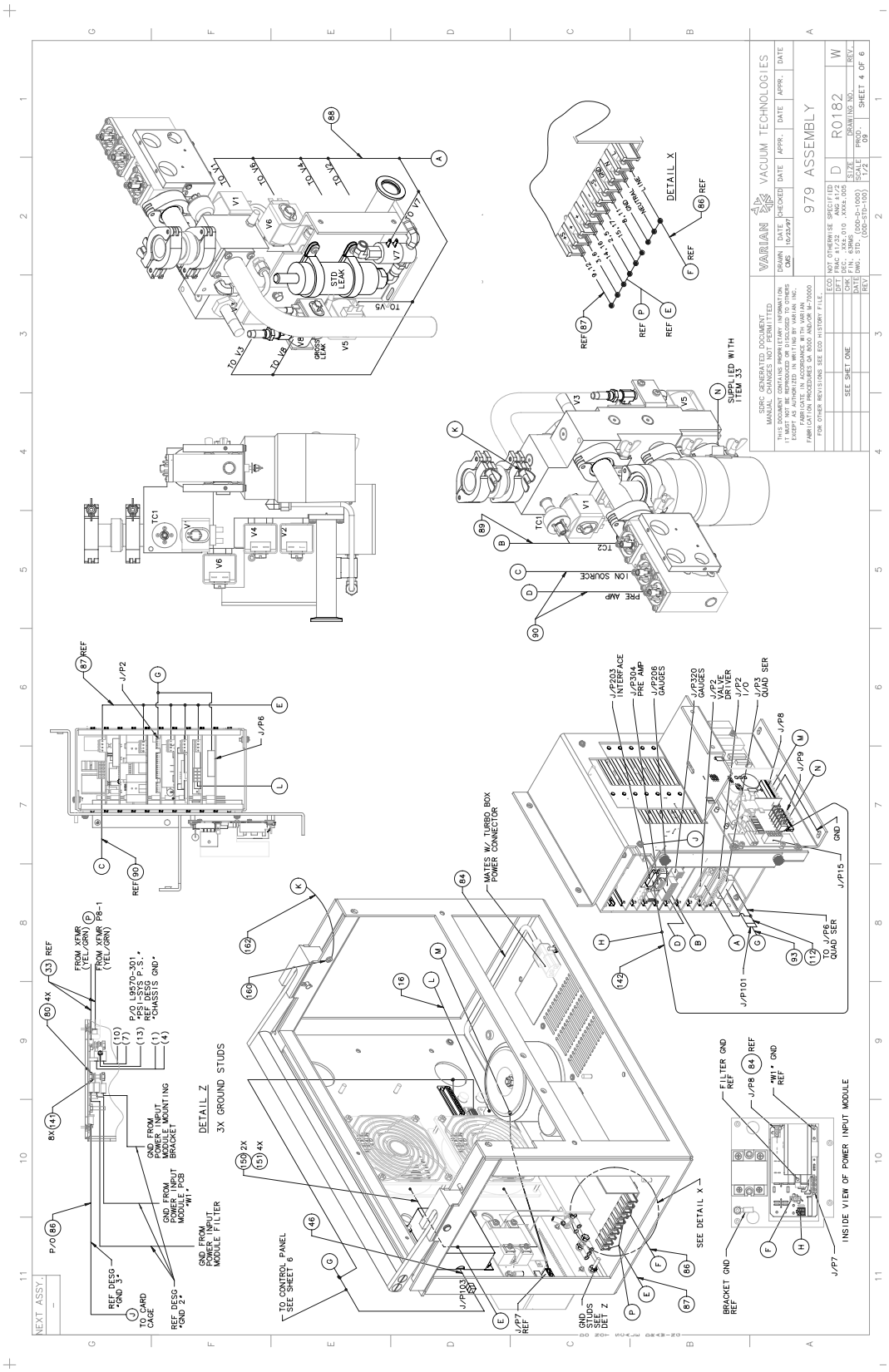
VARIAN VACUUM TECHNOLOGIES
979 ASSEMBLY
D
R0182
W
SHEET 4 OF 6
DETAIL X
DETAIL Z
3X GROUND STUDS
INSIDE VIEW OF POWER INPUT MODULE
ION SOURCE
PRE AMP
STD LEAK
GROSS LEAK
TO CONTROL PANEL SEE SHEET 6
MATES W/ TURBO BOX POWER CONNECTOR
NEXT ASSY

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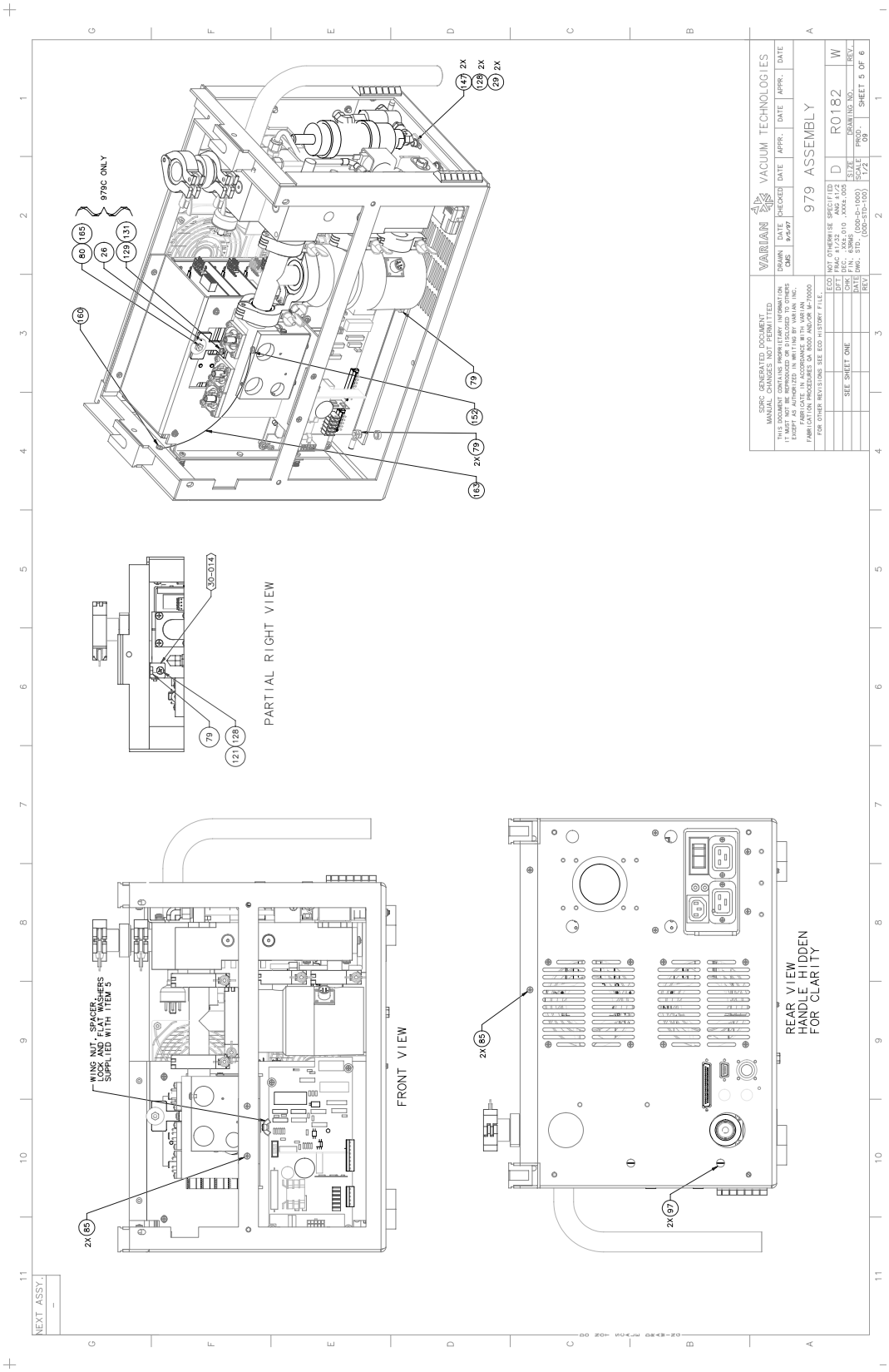
979C ONLY
PARTIAL RIGHT VIEW
FRONT VIEW
REAR VIEW
HANDLE HIDDEN
FOR CLARITY
WING NUT, SPACER,
LOCK AND FLAT WASHERS
SUPPLIED WITH ITEM 5
VARIAN VACUUM TECHNOLOGIES
979 ASSEMBLY
R0182
SHEET 5 OF 6
NEXT ASSY.

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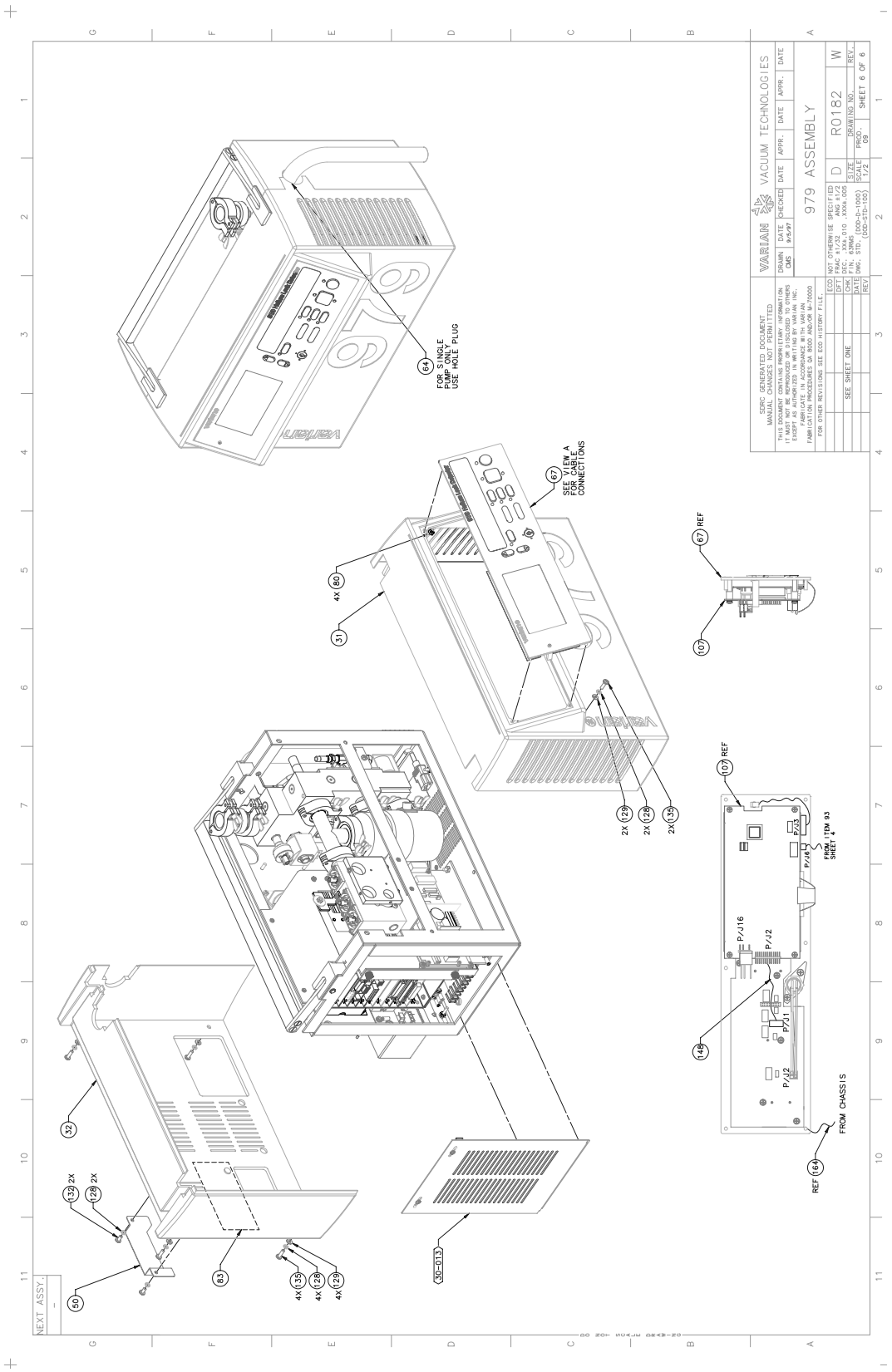
64
FOR SINGLE PUMP ONLY USE HOLE PLUG
67
SEE VIEW A FOR CABLE CONNECTIONS
4X 80
31
67 REF
107
2X 129
2X 128
2X 135
107 REF
P/J13
P/J16
P/J2
P/J1
P/J2
FROM ITEM 93 SHEET 4
FROM CHASSIS
148
REF 164
32
135 2X
129 2X
50
83
4X 135
4X 128
4X 129
30-013
NEXT ASSY
VARIAN
VACUUM TECHNOLOGIES
979 ASSEMBLY
R0182
W
SHEET 6 OF 6
SEE SHEET ONE

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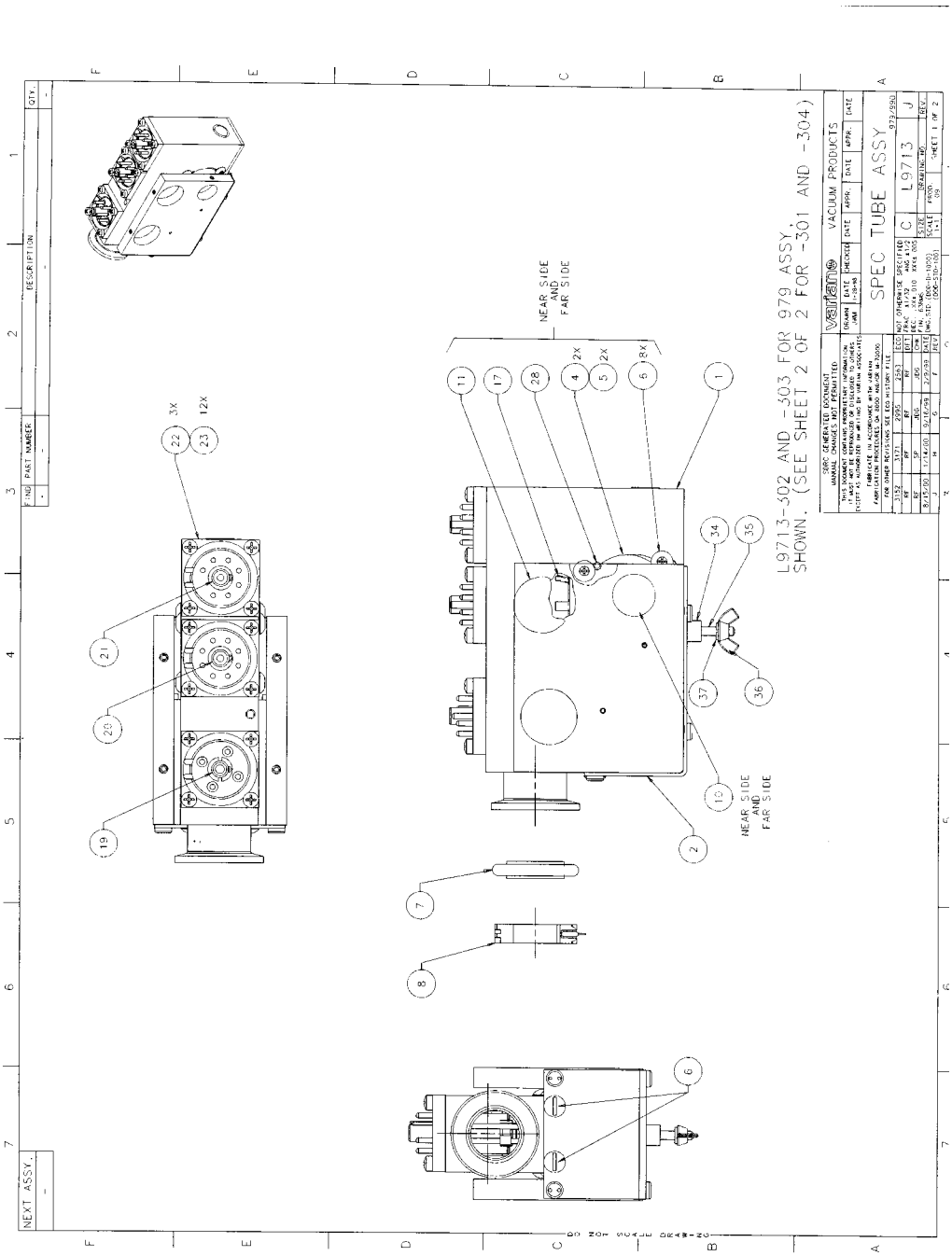
L9713-302 AND -303 FOR 979 ASSY.
SHOWN. (SEE SHEET 2 OF 2 FOR -301 AND -304)
NEAR SIDE AND FAR SIDE
VACUUM PRODUCTS
SPEC TUBE ASSY
L9713
NEXT ASSY.
PART NUMBER
DESCRIPTION
QTY.

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Appendix B. 979 COM Cable

Table B-1 provides non-isolated RS-232 serial interface information. Figure B-1 shows the cable wiring diagram from a standard RS-232 DB-9 connection to the 979C I/O DB-37.

RS-232 serial I/O connections are referenced to the chassis ground and are not isolated. Electrical characteristics comply with EIA/TIA Standard EIA/TIA-232-E.

Table B-1 Summary Table of Non-Isolated I/O

J101/Pin	Input Name	Signal Spec	Description
15	RxD	RS-232 Spec	Receiving Data to the 979.
16	RTS	RS-232 Spec	Request to Send from the 979.
17	TxD	RS-232 Spec	Transmitted Data from the 979.
18	CTS	RS-232 Spec	Clear to Send to the 979.
19	GND	RS-232 Spec	Signal Common.

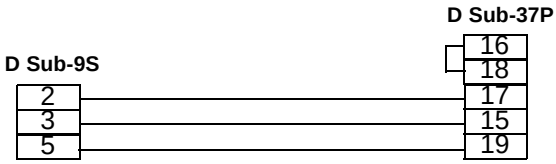

Figure B-1 979 COM Cable Wiring Diagram

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Appendix C. 979 Spare Parts List

Table C-1 979 Spare Parts

Assembly	Part Number
Ion Source	82850302
Button TC	R1266301
Preamplifier	L9030301 (Std Sensitivity) R1003301 (High-Sensitivity)
Thermocouple Gauge (TC), Model 531	F0472301
Spectrometer Tube Magnet Assembly	K3023301
Spectrometer Tube Assembly Exchange Program	EXL9713302 (Standard Sensitivity) EXL9713303 (High Sensitivity)
Spectrometer Tube Cleaning Kit	670029096
Calibrated Leak (Low 7 Range)	Call Varian
Calibrated Leak (Low 8 Range)	Call Varian
Main Power Supply	659077039
Ion Source Controller PCB	L9539301
Digital Interface PCB	L9536301
Preamplifier Driver PCB	L9524301
Gauges PCB	R10414031
Brain PCB	670079050
Power Supply PCB	L9255301
979 I/O PCB	Call Varian
Touch Screen Assembly	Call Varian
Front Housing	Call Varian
Rear Housing	Call Varian
V70LPM Turbo Pump Exchange Program	Call Varian
Tip Seal Set, Triscroll 300 Family Primary Pump	PTSS0300TS*

*Requires Maintenance Tool Kit for installation

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Table C-1 979 Spare Parts (Continued)

Assembly	Part Number
Maintenance Kit, Triscroll 300 Family Primary Pump	PTSS0300MK*
Maintenance Tool Kit, Triscroll 300 Primary Pump	PTSS0300TK
Oil Mist Eliminator Cartridge (Qty 2)	949-9394
Valve, Pump Isolation, NW25, 120 V 50/50 Hz	VPI2512065060

*Requires Maintenance Tool Kit for installation

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